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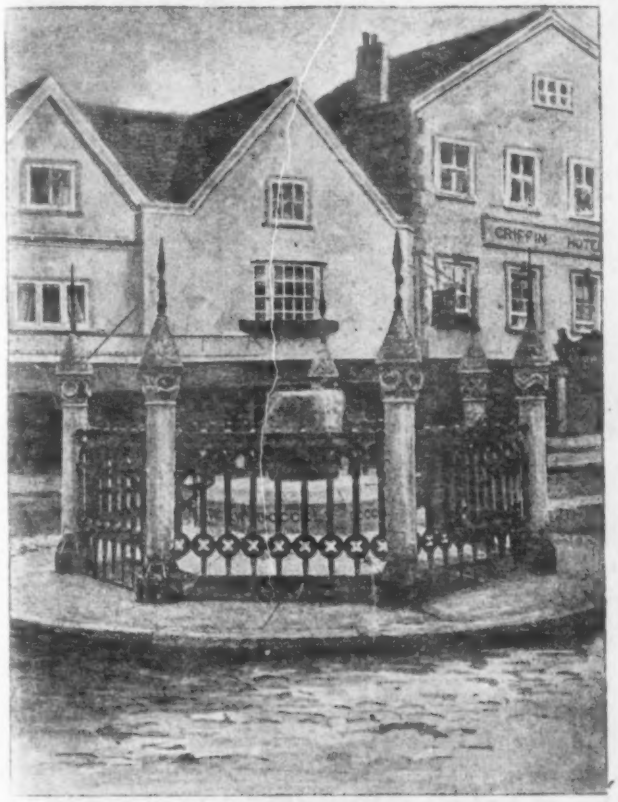

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FOR THE SCHOOL-ROOM AND THE STUDY

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EDUCATION IN PARLIAMENT—MAY.

THE long-expected, come-at-last second-reading debate on the Bill to revolutionise educational arrangements in South Britain took place under favourable circumstances, from the 5th to the 9th of May. Its opening coincided with the coming into operation of the new Parliamentary rules and hours. New rules, a big Bill, a vast new departure—a momentous occasion! For good or ill, the thing has been done, and I fancy there were some men in the House of Commons—two or three at least—who felt upon their shoulders then a burden of responsibility never felt so heavy before. Some augurs at least there were who scanned the Bill and the future with anxious eyes; for the Bill has "put it to the touch, to gain or lose it all."

Pride, and the consciousness of secret power, must have swelled the breasts of the two or three, for the Bill is the direct result of the policy of the elementary school teachers. The One Authority idea is almost solely due to them. They enounced it, they spread it, they fought against all bills that did not contain it. The power of an organised body of units, individually weak, but compact and purposeful, and represented ably at St. Stephen's, was never before so clearly seen. It was the representatives of the National Union of Teachers who pressed the idea on the Royal Commission on Secondary Education; it was Mr. Yoxall who appended to the report of that commission a memorandum urging that nothing should be done legislatively which would hinder the ultimate realisation of the One Authority principle. The report appeared in 1895. In 1896 the Government Bill on Education contained the germ of the same idea. In 1901 a Bill which went against it was killed from the moment of its first reading. In 1902 a Bill triumphantly passes its second reading, which affirms that principle at all costs.

At all costs! There is where the responsibility and anxiety come in. For good or ill, the School Boards are to end; for good or ill, a municipal committee is to come into play in the elementary education world; for good or ill, the Voluntary schools are to come under local public control. Probably all this will be for good, possibly it will be for ill; but the anxiety of the alternative must weigh heavily upon those who planned the change, advocated it, popularised it, shared in it, and see it come to pass. The very fact that the Bill does so much with regard to elementary education, and so little (except potentially) with regard to secondary education, gives the measure of the power which the National Union of Teachers wields in our day as compared with that which secondary teachers exercise in politics.

The Bill, and the whole Bill, for better or worse. At present the Opposition think it will be for worse. That is, of course, the constitutional attitude of an Opposition, and very persistently and eloquently they opposed. I cannot deem the speech in which Mr. Bryce kicked off the Bill for the Opposition a great performance. It was a creditably close-reasoned speech, an analytical exposition of the Bill from the opponent point of view; but it was not a second-reading speech in the Parliamentary sense—that is, it was not a speech of brilliant generalisation, mainly concerned with principles and outlines, and little with details. It was, in fact, the kind of speech which an able King's Counsel at the Parliamentary Bar would make when voicing the opposition to a Railway or Water-works Bill before a committee "upstairs," as they say in the House of Commons. And it was a speech defective in two important respects: it was motived throughout by complete antagonism to the Bill and every part of the Bill; and it was motived by an intense desire for the separate local government of

Next Month:

LARGE ILLUSTRATED SUPPLEMENT

Will be Presented.

secondary education. The One Authority for which Mr. Yoxall fought on Mr. Bryce's commission is still unpalatable to Mr. Bryce.

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None the less, his speech was a capable performance. It was the first speech in the House of Commons under the new rules, and it aptly began a great debate. The rules and hours were new, the subject was almost new, and for the time being the House was a new broom. It swept clean to begin with. No more workmanlike discussions have been heard in the House of Commons for many a year—no franker, abler, clearer, more dispassionate dealing with a great Bill on a great and difficult subject. If the Second Reading debate could be taken as the augury at this opening of a new era in English education, then the omens for the change are good. But it is unsafe, of course, to estimate in that way. We are by no means yet out of the wood.

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Of Sir John Gorst's speech I will say that it revealed the man undecked with the usual brilliant disguise of wit and paradox. For Sir John it was a dull speech, and therefore it showed the more clearly the kind of man he actually is. Absence of moral purpose, freedom from heart, pure brain, mere intellectuality, no fervour, the cold, dry light of thought—that is Sir John, and that explains his comparative failure in the Parliamentary career. Less brain and more of the human qualities of heart and emotion would be a better equipment for him. The House of Commons is very human: it distrusts the merely clever man.

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The speeches in the debate were brilliant and long—or rather, some were brilliant and many were long; and those that were not brilliant seemed terribly long. There was a great desire to speak among the M.P.'s, and though the discussions lasted five days, many who wished to orate were shut out. The course of the debate in this respect has gained adherents to the proposal by Major Rasch (an antagonist of the Bill) that speeches should not be allowed to exceed twenty minutes in length, with certain exceptions. The quality in the speeches that most struck the critical listeners was that most of them were for the most part not about education at all. Lord Hugh Cecil talked Anglicanism and theology, Mr. Lloyd-George talked militant Nonconformity, Sir William Harcourt talked rates, Mr. Balfour talked Parliamentary polemics. Only Mr. Haldane seemed to be talking much about education itself.

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The speeches of the "dauntless three" showed ingenuity. Mr. Gray was this time, of course, "on velvet." So often he has had to go against his party that he deserved the welcome change; but for Mr. Yoxall and Dr. Macnamara the situation was difficult. Educationalism would have them partly bless the Bill; party would have them wholly ban it. They took the critical line, and talked details. When the division came, curious eyes were turned upon them—the two who walked into the "No" lobby, against the Bill.

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Two votes against it, however, counted as naught. A huge majority for it was certain. The Irish Nationalists voted for it to a man. Major Rasch, mindful of derelict farms in his Essex constituency, voted against a measure which means rates on rural land. By two hundred and thirty-seven majority, in a House of five hundred and sixty-seven, this fateful Bill was carried in its principal stage at a quarter-past midnight, on the ninth of May. This will be a date and an event to count in the history of education in England. As fateful as 1870 will 1902 come to be. The Government have "builded better than they knew." The Bill means revolution.

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One would never have dreamed that the Bill means revolution, judging by the pacable and placable tone of the debate, however. The opponents roared like any sucking-dove. The fact is, that on both sides of the House of Commons opinion has softened, and neither theological nor party views now suffice to choke a general longing for efficient national education. The most gratifying feature about the whole debate was the longing for efficacy, and the putting of education foremost. It needs no Galileo to tell that, after all, the school-world *does* move. And to think that the fulcrum has been the arresting efforts of Mr. Cockerton and the "Cockerton" Committee!

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That was the fulcrum; the lever was the desire of the Church party to save, and then get rid of the bother of Church schools. Fortunate for the advocates of the One Authority was it that a new Authority was necessary if Voluntary schools were to be put on the rates; and thus, by a combination of those "private interests and partial affections" from which the House of Commons prays to be delivered every day, the Education Bill of 1902 came into being. From such causes do events in this country of ours spring. England is blundering into education, just as she blundered into empire. Let me not forget to mention one side goad and fortuitous spur. All through the debate the thought of the new "shipping combine" seemed present with members; the discussion was full of references to American schools. I thought of Cowper's Boadicean threat to Rome, "Hark, the Goth is at your gates!" The House seemed to be thinking of it, too.

FERULA.

Presentation Day at London University.—On May 14 Lord Rosebery presided at the crowded meeting of those who had graduated during the past academical year, and of their friends. After the formal report by the registrar, the graduates were presented to the chancellor, and received their degrees. To judge by the numbers presented, the popularity of the London degree holds its own against the newer universities in the provinces. Among those who received their diplomas it was interesting to everybody to see so many ladies, and to us in particular it was a matter of great pleasure to see what a number owed their degrees to the work begun in pupil-teacher centres, and carried on in the training colleges. After a few remarks from the vice-chancellor, Sir Henry Roscoe, and the chairman of convocation, Sir Edward Busk, Lord Rosebery addressed the meeting. After thanking the members of the university for having unanimously elected him as their chancellor—the first elected under the new scheme—he spoke in praise of the chancellors who had preceded him, closing with a very touching tribute to the late Earl Kimberley, praising him not only as a statesman, but as a student—one who through life found relaxation in the intervals of parliamentary business in the perusal of his favourite Greek and Latin authors, and who late in life worked hard at Italian in order to enjoy the beauties of Dante. A short speech from Sir Michael Foster, M.P. for London University, brought the meeting to a close.

Two Excursions to Belgium in the summer holidays are being organised by Miss Walter, Inspector under the Board of Education. These are intended especially for pupil teachers, and particulars may be obtained from the pupil-teacher centres, or from Miss Walter, 38 Woodberry Grove, Finsbury Park, N.

BRITISH MUSEUM

BY MANY HANDS.

"Quot homines, tot sententiæ."

IN his characteristically able address before the new section—Educational Science—of the British Association, Professor H. L. Withers defines education as the process by which the undeveloped young are adjusted to their environment, physical and human. That being so, the end aimed at by those into whose hands the education of the young is intrusted must be regarded as "*healthy activity in relation to nature and man;*" and to secure this end it is essential that clear ideas be formed upon the following points:—

An Educational Ideal—

(*a*) Physical health in the home and in the school, and indeed generally.

(*b*) A sound correspondence between the mind of the child and the physical environment which forms the background of human life.

(*c*) The cultivation in the child of sympathy—in its broadest sense—with others, together with the power clearly to express that sympathy; the acquisition of a knowledge of human nature and its expression in art and literature, and more especially of the history of the human race and of the gradual evolution of man to his present proud position in the universe.

IT is obviously essential that before the educator attempt the responsible and vitally important task of adjusting the young child to his environment, he himself must have received careful training in, among others, the following subjects:—

—and the Training of the Teacher.

1. Human physiology and hygiene, with special reference to the growth of the child and the healthy functioning of the growing brain and nerves.

2. The theory of the curriculum, including a careful consideration not only of the comparative values of the various subjects to be studied, but of the order and mutual relation in which they should be presented to the developing mind.

3. The theory of method, embracing a study of the best conditions under which the greatest mental activity may be attained without overstrain, and thus including a knowledge of the symptoms and causes of brain fatigue.

4. The conditions under which such desirable qualities of character as courage, firmness of will, and kindness are best developed. The scientific study of play, of imitation, the force of suggestion, the influence exerted by the school community and by school institutions, and so forth, would naturally be included in this section.

It is quite certain that the actual condition of affairs falls distinctly short of the ideal thus briefly outlined; and it is to be hoped that in the near future something will be done by the Board of Education insisting that teachers receive a training upon the lines laid down by Professor Withers. It is certainly worse than absurd, for example, to insist upon an hour's physical training per week in our schools, without insisting, as a matter of course, that such training should be given by well-qualified instructors, instead of being left, in the majority of cases, in the hands of those who know little or nothing of the development of the child or of the physiology of exercise. The training of teachers in other respects is easily susceptible of considerable improvement, and, indeed, must be improved before they can be regarded as properly equipped for the task of adjusting the child to his environment; of securing that "healthy activity in relation to nature and man" referred to above as the end which education has in view.

THE home of Conference has a large share in determining the quality of one's Conference impressions. Last year it was housed in a theatre, and, as a consequence, our impressions were all more or less dramatic. We defy any one to escape such a suggestion when looking at the Executive neatly grouped on a stage with wings, painted background, and proscenium. Pressmen in the orchestra, most appropriately; well-known delegates and visitors peering out from becurtained boxes, and a packed auditorium rising tier on tier to the "gods"—what mortal could sufficiently repel the suggestion of drama about the whole Conference? This year Conference was housed in a concert-hall, and we succumbed at once to the all-pervading suggestion of a musical performance—but a musical performance such as we have seen in Paris, where some of the performers are distributed among the audience, and considerably augment the hilarity of the occasion by insisting on rising in their places and criticising the performance of those on the stage, eventually taking a part in the show themselves.

Conference Impressions.

THE performance at Bristol might have been described as a cantata called "The Bill," given in the Victoria Rooms by a highly-trained body of principals (from the Yarmouth, York, Cambridge, and other concerts), with a powerful chorus got together for this occasion, supported by a picked band of quill and stylo drivers. Conductor, Mr. Allen Croft. And as a performance it resulted harmoniously enough, although the chorus was at times out of tune, and inclined to disobey the conductor's beat, and even the principals found it expedient to modify the reading of their solos. But with much tact, yet with great firmness, Mr. Conductor Croft got his huge body of performers well in hand, and an impressive performance was the result.

The Bristol Cantata.

It is not too much to say, joking apart, that to the admirable tact of the new president the success of the Conference was due in no small degree, and the class teachers have every reason to be proud of the representative they have placed in the presidential chair.

THERE were some pearls in the way of metaphors, and the usual choice "derangement of epitaphs," to quote Mrs. Malaprop. An East Londoner became quite agricultural in his language, describing sundry movers of amendments as "the gentlemen from the fields of London;" and in trying to cap a story told from the platform, in which the word "manure" figured prominently, he went so far in his hurry as to say "he had been mixed up with it for years." But the gem of the Conference was perpetrated by an ardent soul who was unburdening himself concerning the great topic. "The Bill was a sop," he said, "and when teachers had taken the sop into their hands, it would turn into a Dead Sea apple." This was

Some Flashes.

too much for the gravity of everybody, and keen as the debate was at the moment, the "sop" was received with shrieks of laughter. Indeed, the very aridity of the main subject of debate made the huge audience all the more susceptible to the blunders and amusing distortions of speech to which even the most practised hand is liable, and in which the ardent novice often abounds.

FOR the curious in such matters, we recommend a cheap reprint in German by Freytag, in Leipsic, of the *Orbis Pictus* of Comenius. In studying the history of education, everybody becomes familiar with its name. For a sixpence they can now examine the book itself. It was the first illustrated school-book, and from it one can estimate the length of road travelled in the direction of illustrations since the publication of this famous little book in 1657. It was also one of the very first attempts at a rational method of teaching languages, and those interested in modern language teaching will look curiously at the start made in this direction by the great Bohemian. His little book is a talk about the world in Latin and German, in parallel columns, with grammatical explanations in a third column. Those who talk loudly of the "new method" of teaching modern tongues will find here that there is nothing so very new about these methods after all; for Comenius provides words, connected speech, grammar, and pictorial illustration for every lesson.

The "Orbis Pictus."

THE cuts are very quaint. They are wood-cuts of the most primitive kind, and are interesting from the point of view of the development of wood engraving. Not the least quaint is the living alphabet which forms the opening. In it the sound of each individual letter is taken from the cry of some animal, bird, or insect. First comes a rough picture of the creature, followed by two sentences in Latin and German saying what it does, and then the sound of the cry is imitated. A fourth column contains the letter of the alphabet whose sound the cry represents. The picture alphabet of our childhood is thus only a bad imitation of this much more correct "living alphabet" of Comenius. In his reprint of this deeply-interesting little book, Dr. Tupetz has had to omit many of the sections and cuts; but the headings of all of the sections are given, and sufficient of the cuts and lessons to enable one to form a very complete idea of the book. It forms one volume of a series of cheap reprints of educational classics; and it is striking that when a student of pedagogy wishes to possess one of these classics, he has nearly always to turn to Germany or America in order to procure it.

Things New and Old.

N.U.T. NOTES.

WITH a view to taking "time by the forelock," the new Executive met a fortnight earlier than it has ever done within my recollection. The decision to meet as soon as possible was wise and sound, for the year's work is bound to be heavy, especially since the Government has announced its intention of going through with the Education Bill. A glance around the "double horse-shoe" in the handsome board room at Bolton House—the name which dignifies the Union's new home at 67 Russell Square—revealed some half-dozen new faces. Messrs. Moorby and Hindmarsh made a welcome re-appearance, and were cordially greeted by their former "comrades in arms." Of the four gentlemen elected to the Executive for the first time, the best known is Mr. Prosser of Bath, one of the sturdiest Unionists in the country, who is both respected and loved over a wide area. His accession to Executive honours was signalised by a bright little complimentary dinner, attended by many representative citizens of Bath (including the ex-mayor of that fair city), the president and vice-president of the Union, a goodly contingent from Bristol, and some fifty or sixty of his own townsmen. The toast of "Our Guest" was proposed, in felicitous terms, by Mr. W. H. Crossman; and Mr. Prosser had a great reception when he responded, in a speech full of manliness, and tinctured with both feeling and humour. Another new member is Mr. Walter Shawcross, a class master under the Manchester School Board, who almost leaped into fame on the occasion of the visit of the N.F.A.T. Conference to Cottonopolis, two years ago. His successful labours, in a representative capacity, on behalf of a numerous section of the profession, encourage his many friends to hope that he will make his mark at the Executive. Mr. Hyden, who takes the seat formerly occupied by my good friend Mr. I. G. Maguire, is a comparative stranger to "the general," though his efforts on behalf of education and the Union are well appreciated in the "far north." The last new member, Mr. Winfield, is a prolific writer, especially on rural education, and, if one can judge by his first appearance, is inclined to suffer from *cacoethes loquendi*. "The 4,000 rule" gives to both Lancashire and Yorkshire a fourth member, and (including the officers) the Executive now numbers six-and-forty.

The New Executive.

NATURALLY, the *real* work of the Union is performed by the seven standing committees of the Executive, which deal laboriously and carefully with the thousand and one matters coming within their particular purview. Their reports are presented to the next Executive meeting; and so thoroughly are the various questions ventilated "in committee," that in the majority of instances their recommendations are accepted without discussion. Considerable importance and no little responsibility are attached to the office of chairman of each of the committees, and I append a list, showing on whom the distinction has fallen:—

Its Standing Committees.

Standing Committee.	Chairman.	Vice-Chairman.
1. Law	Mr. T. John.	*Mr. W. Hurden.
2. Tenure	*Mr. T. H. Jones.	*Mr. T. P. Sykes.
3. Education	*Mr. G. Sharples.	Mr. A. R. Pickles, B.A.
4. Parliamentary	Mr. M. Jackman.	*Mr. J. J. Cullum.
5. Organisation	*Mr. G. J. Rankilor.	*Mr. A. S. Caudle.
6. Finance	*Mr. F. Peaker.	*Mr. F. C. Blackburn.
7. Examinations Board	*Mr. T. F. Bowers, B.A.	*Miss Cleghorn, L.L.A.

* Held the same office last year.

A lengthy debate, characterised by some little heat, was initiated by Mr. Thompson, who wished the committees to elect their own chairmen and vice-chairmen. One speaker was responsible for the extraordinary statement that he could give the names of men who were appointed chairmen, "not because of their ability, but because they were members of cliques." Considering

that *four* of the chairmen in the above list were elected unanimously, and that only Messrs. John, Sharples, and Jackman had the pleasurable excitement of a contest, it would be an interesting question to put to the intelligent Unionist: "Which of the three owes his success *not* to ability, but to the machinations of his clique?" In my humble judgment, the Executive acted wisely in keeping within its own power the election of the committees' officers, and I am convinced the selection made was a wise one. It is now an unwritten law that neither the president, vice-president, nor (immediate) ex-president should aspire to any chair; and I further hold to the opinion, expressed in these "Notes" a year ago, that no man who has held the "Blue Ribbon of the Union" should prevent a younger Executive member gaining experience and confidence, as chairman of an important committee of the Executive.

* * *

The Late Mr. E. L. Oliver.

THE May meeting of the Executive was saddened by the intelligence of the somewhat unexpected demise of Mr. Edward Oliver, one of the South London representatives. He had been ailing for some months, and unable to attend to either his professional or Executive duties. Yet his courage never flagged, and his patient endurance under continued suffering was altogether wonderful. Less than three weeks before his death, I had spent a Saturday afternoon with him, and been astonished at the keen interest he then—as always—displayed in Union matters. He felt so far better that he was looking forward to again taking his place round the Executive board, but it was not to be. He has entered into his long rest, and we are the poorer for his loss. Although Nature had not endowed him with a strong physique, he was, until his last illness, ever at his post, doing what was possible to help on the great work which lay nearest to him. Kindly in disposition, genial, and singularly unobtrusive, he was dear to us all; and the brief eulogies uttered by four of his late colleagues were amongst the saddest and most solemn words it has been my lot to hear. Years before he became a member of the Executive, he had striven zealously on behalf of the widows and orphans, the suffering and the distressed, and had been honoured with the chairmanship of the B. and O. Council. And now he is gone. The tender sympathy of every Unionist will be respectfully evinced towards his bereaved widow and sorrowing children, whom it is my great privilege to know. Only a few days before his death a testimonial fund was started amongst the representative bodies which meet at the Union's offices, and Mr. C. W. Hole (who, along with that sterling "good fellow" Mr. F. C. Blackburn, had visited and cheered our departed fellow-member almost weekly) is officiating as its treasurer. The fund will be doubly valuable now that the bread-winner is no more.

* * *

"B. and O." Council.

THE new Council of the N.U.T. Benevolent and Orphan Fund differs but little from its predecessor, so far as *personnel* is concerned. Possibly it will be remembered how at Yarmouth, in 1901, the annual meeting of the subscribers—either scandalised or hypnotised by the ruthless rejection of old and tried members—swung back incontinently to the ancient method of electing the Council, after but one year's experience of "electoral districts." With the exception of two only, last year's Council is re-elected; and Mrs. Truelove (a fine worker for the charities) and Mr. Richard Greenwood (largely responsible for the acquisition of the magnificent Boys' Orphanage) replace Messrs. Baldwin and G. S. West. Mr. B. South of Manchester was unanimously chosen as the Council's chairman, and heartily cheered as he took possession of the seat of honour. With characteristic good-humour, his first act, after returning thanks, was to challenge Liverpool—through the medium of his good friend Mr. Mennie—to beat Manchester's contribution towards the £15,000 now required yearly for the work of the charities. Emulation and rivalry of this class will have universal commendation. Mr. C. J. Chase and Mr. Weston were nominated for the vice-chairmanship, and the "twenty years' connection with the Fund" of the former gentleman ensured for him the victory. I sincerely trust Mr. Weston's turn will come next year, for his record of work is alike lengthy and most honourable. The important Standing Committees of the Council are:—

	Chairman.	Vice-Chairman.
1. Finance, etc.....	Mr. H. Weston.	Mr. C. W. Hole.
2. Relief and Loans	Mr. T. F. Bowers.	Mr. J. Hodge.
3. Organisation.....	Mr. T. G. West.	Mr. F. F. Wheeler.

There is no change in the officers of any of the committees.

* * *

Last Year's Work.

THE Report of Mr. T. G. West (the enthusiastic and indefatigable chairman of the Organisation Committee) is, as heretofore, full of interest. Although the receipts are actually £600 *less* than those of the previous year, it is Mr. West's opinion that "an examination of all the circumstances of the case in reality shows a considerable *increase* in what might be termed the *ordinary* revenue. The grand total is materially affected by the character of the district in which the Conference is held. Thus, a manufacturing district will always yield a greater return than a rural area; hence it is not surprising to find a difference of £2,000 in the Conference efforts of 1900 and 1901. Making due allowance for this variation, and also for the £400 already received in connection with the Conference of 1902, we have *an increase in the ordinary contributions of more than £1,000.*" This is eminently satisfactory, and the table subjoined shows how each district has aided in the noble work.

1901.—Summary of Contributions from Electoral Districts.

Dist.	Title of District.	Contributions.	Averages.		
			1899.	1900.	1901.
		£ s. d.	s. d.	s. d.	s. d.
1.	North England...	576 1 0	4 5	3 8	4 2
2.	Lancashire.....	1,388 16 6	4 8	4 10	5 3
3.	Yorkshire	1,029 8 2	5 0	14 6	4 4
4.	North Midland...	795 11 0	4 5	4 3	4 5
5.	South Midland...	1,070 16 5	4 4	5 0	5 6
6.	East Anglia.....	1,333 4 9	5 2	3 9	8 1
7.	South England...	857 11 1	4 3	5 7	4 8
8.	West England....	1,086 1 10	4 3	4 3	6 5
9.	Wales.....	517 13 6	2 2	2 6	3 2
10.	North London....	611 17 0	3 8	3 6	3 7
11.	East London.....	885 6 6	4 7	4 4	4 8
12.	South London....	898 1 4	3 11	4 5	4 7
1901	Totals.....	11,050 8 8	4 3	5 4	4 11
1900	Totals.....	11,627 14 0			

NOTES FROM THE NORTH.

DR. STEWART, H.M. Chief Inspector, in his Report for 1901, recently issued, draws attention to one of the evils most clamant at the present time in connection with our elementary schools: I refer to the question of the high ages at which many of our pupils are beginning their education. The recent Education Act, by raising the age of school exemption to fourteen years, is not wholly responsible for this state of matters, though many are looking upon it as so. It is due in many cases to the lack of accommodation—a condition of affairs which has only been intensified by the recent Act. Dr. Stewart, in referring to the returns of the Edinburgh School Board, says: "It appears that there were 567 scholars on the registers of infant departments in their schools who were over nine years of age. Of this number eighty-three were ten; nineteen, eleven; six, twelve; and two, thirteen years of age. On the registers of junior departments (with attainments not beyond those of the third standard) there were no fewer than 854 scholars over twelve years of age; 289 of these were thirteen, and 23 fourteen years old. This is a very unsatisfactory state of matters." Dr. Thomson, H.M. Inspector, in the same report, likewise refers to the subject. Our School Boards and managers would require to keep this subject continually before them, as it will be of little avail for the Department to raise the age of exemption if School Boards are not equally strict in enforcing attendance at the other end of the school career.

High Ages of Pupils Admitted to School.

THE teachers of Scotland, if we may judge from the correspondence which has passed between the Scotch Education Department and the School Board of Rhynie, Aberdeenshire, are in very safe hands. Dismissals will, I have little doubt, be less frequent in the future; at all events, the Education Department will have to be fully satisfied that the teacher is incompetent. Sir Henry Craik, in a letter to Rhynie School Board re the dismissal of Miss Anderson, says: "My Lords can come to no other conclusion, from a general review of all the circumstances, than that the management of the school has not been such as to inspire confidence in its efficiency; and that this is due largely to the conduct of the clerk, and to the influence which he has been permitted by the School Board to exercise, to the prejudice of the school, and of proper relations between the School Board and the staff."

The Rhynie Dismissal Case.

THE Educational Institute of Scotland appointed a deputation to meet with the School Board, but they were refused a hearing. Mr. Duthie of Aberdeen, however, has done an immense amount of work in connection with the case, and the teachers of Scotland are under a serious obligation to him for his efforts. The correspondence, now published by the Department, shows that teachers in their quarrels with School Boards have little reason to complain of the attitude of the Department. It also shows how well founded are many of their contentions, and that the extension of the School Board areas is the only way to secure teachers against capricious dismissal or vexatious annoyance. I trust that in the near future Lord Balfour will be able to pass such a measure as, if rumours are to be believed, he is at present contemplating. The Department as yet have taken no action in this case further than the publication of the correspondence and threatening the suspension of the grant.

Lessons of the Case.

DR. MENZIES, ex-President of the Institute, was entertained at the end of last month to a complimentary dinner, in recognition of the honour implied in the degree recently conferred on him by the University of St. Andrews. We offer him our sincere congratulations on the honour done, not only to him, but to the Educational Institute. In reply to the toast of his health, Dr. Menzies referred to the compliment as one to the profession. He said that his past services to the cause of education, whether as a teacher or as a member of the Institute, had only been part of what he considered his duty. He had devoted to the service of the Institute all the time he possibly could, and whatever ability he possessed. His experience as president had been very useful as well as pleasant, and it had enabled him to see the inner working of an institution which had rendered great service to the cause of education in the past, and which was destined to benefit it still more in the future. I trust that this is but a precedent, and that our universities will in future recognise the work the Institute is doing on behalf of Scottish education.

The Ex-President of the Institute.

AS president of the Edinburgh branch of Scottish class teachers, Mr. T. N. Hepburn ("Gabriel Setoun") gave some very valuable advice on the subject of Union. If members were able to fight shoulder to shoulder against purely personal grievances, he conceived that they were able to fight against grievances that were professional and national. A local loyalty was a small thing; a loyalty that only found play within a geographical area might sleep satisfied in an indolent security, but it was narrow in conception and selfish in aim. It was not loyalty to great principles; the loyalty that was ever on the watch learned to see far, and sought progress all round. They could only do good by working harmoniously together and as a whole; they could only achieve the ends they had in view by securing that all class teachers should become members of some educational organisation. They had a common goal, and their cause was education, progress, and prosperity. They should not forget that they were a power—a power to be reckoned with in the arrangement of curricula and the making of codes.

"Gabriel Setoun" on Union.

THE E.I.S. meetings for the session have almost all been held. The great majority of the branches have decided against parliamentary representation. The actual figures show that twenty-one out of the thirty-seven branches sending in returns have, for the present at least, given an unfavourable decision on the question. It would seem to some as if the matter were impracticable. There is need for further education on the subject.

With regard to a general secretary, whose whole time shall be devoted to the work, the same number of branches, curiously enough, are in favour of having such an official, and no doubt when the time comes the Institute will go in for this policy. The branches that were unfavourable thought that the time had not yet come for such action.

E.I.S. Doings.

The voting papers for the president, vice-president, and committee are now in the hands of the members, and must be returned on or before the 31st May.

THE Commission recently appointed on the subject of physical education has not taken long to begin its labours. Teachers from various districts and members of School Boards have this week been giving evidence in London. It is to be hoped that the report will not be delayed, as many are interested in this important subject. The great difficulty that will be experienced in many quarters is how to find time in the already overburdened curriculum for a new subject, or rather for the extension of an old subject. In many cases the physical instruction aimed at will be best given in evening schools.

Physical Education Commission.

R.G.

FOREIGN NOTES.

WE have received from Hamburg a pamphlet which is just now of special educational interest, for it treats of the Higher Grade School as it exists on the banks of the Elbe, and indicates the line of development necessary to meet the increasing requirements of important and numerous strata of the population. This type of school at present merely provides an additional course of one year for the sharp boy who completes the ordinary work of the elementary school a year earlier than the average pupil—that is, at the end of his thirteenth year; or who is willing to prolong his school life a year beyond the exemption age—namely, until he is fifteen. Practically, the Hamburg Higher Grade Schools remain as they were instituted in 1870, and are no longer adequate for the needs of the present generation.

Higher Grade Schools.

THE number of these schools is now twenty-one, but they have proved disappointing. Only half the year is available for vigorous efficient educational work, the first quarter being consumed in levelling up the diverse elements recruited from various schools, and training them to work harmoniously; while the last quarter is disturbed by frequent "desertions." These are caused by the fact that the curriculum is not adapted to the future needs of the pupils, who therefore prefer to take up their calling without delay, and trust to private institutes or continuation schools for the acquirement of the special knowledge they need. Herr Coym, who has perhaps not heard of Cockerton, is weary of this state of stagnation. He advocates widening the scope of these one-year classes by admitting scholars at the age of twelve, and organising a three-year course which shall form a strong link between the elementary and the secondary school, providing, above all, sound instruction in both English and French, and satisfying the thoughtful father who has an eye to his son's future.

Stagnation.

AND what are the educational plums which the Hamburger paterfamilias desires to secure for his son? A better preparation for business pursuits, an easy transit to the Realschule or to the postal and telegraph services, a better general education which shall prepare efficiently for the work of the continuation school or technical institute. He desires all this, but more than all, the coveted success which will entitle his son to *one year only of military service*. The longer we read German educational papers, the more we note the all-pervading stimulus of the Einjährigen-Examen. What a splendidly effective "spur to prick the sides of the intent" of the schoolboy who was born tired! Why do we not advocate conscription at once, that the lazy young Briton may also feel the spur? The time consumed in military service would be amply compensated for by increased diligence in study.

One Year of Military Service.

MR. SADLER'S SPECIAL REPORTS.

VOLUMES VIII. AND IX.

IF Mr. Sadler's excellent volumes of special reports do not receive at the hands of THE PRACTICAL TEACHER that amount of attention which they certainly deserve, it will be because of the prodigality with which they are lavished upon us in these latter days.

Before us are Volumes VIII. and IX., consisting of some 1,500 pages of solid mental pabulum, and which would require two or three complete numbers of THE PRACTICAL TEACHER for adequate consideration. We can, therefore, do little more than point out the contents of each volume, leaving it to our readers to procure the original report, if they would dip more deeply into the well of wisdom that is undoubtedly presented to them.

I.—VOLUME VIII.

This contains 700 odd pages, and is sold for 3s. 2d. It contains the following articles:—

1. The New Law for Secondary Schools in Norway.
2. Education in Norway to the Year 1900.
3. Education in Sweden.
4. Note on Children's Workshops in Sweden.
5. The Nobel Foundation and the Nobel Prizes.
6. The Training and Status of Primary and Secondary Teachers in Switzerland.
7. The Main Features of the School System of Zurich
8. The Ecoles Maternelles of Paris.
9. The Simplification of French Syntax.
10. Primary Education in the Netherlands.
11. Primary and Secondary Education in Portugal.
12. Technical Instruction in Portugal.
13. Hungarian Education.
14. Public Instruction in Servia.
15. Commercial Education in Japan.
16. The Study of Arithmetic in Elementary Schools.
17. A Suggestion as Regards Languages in Secondary Day Schools.
18. Newer Methods in the Teaching of Latin.
19. Three School Journeys in Yorkshire.
20. The School Journey made by the Students at the Westminster Training College, 1877–1900.
21. A Plea for a Great Agricultural School.
22. The Education, Earnings, and Social Condition of Boys Engaged in Street-Trading in Manchester.
23. Sketch of the History of Educational Work in the Late South African Republic.
24. The Education of Asiatics.

We can hear the "Hold, enough!" of our readers; but there it is, quite an encyclopædia!

Sections 9, 19, and 20 can be at once dismissed, as they have already been dealt with at length in the columns of THE PRACTICAL TEACHER.

Norwegian Secondary Schools appear to be trending in the right direction in so far as they prefer modern languages to classics, and are built upon the primary school, the aim of the law of 1896 being the linking of schools of all grades in one homogeneous system, a work which remains to be done in slower England.

Primary Education.—The Norwegian primary school

has a seven years' course, adapted for scholars between seven and fourteen years of age. It is free to all children in the kingdom. There is no obligation to attend the public primary school; but the obligation of education exists, in that every child between eight and fifteen in the country, and between seven and fifteen in the towns, not in receipt of instruction calculated to bring it up to the standard of the primary instruction, within its fifteenth year, is referred to the primary school, and the attendance of the child there can be enforced by a fine imposed upon parents or guardians. Full particulars of all classes of schools, from the training college to the school for defectives, are given.

Sweden.—The special features of Swedish education are set out as follows:—(1) The importance assigned to manual training in primary education; (2) the strong tendency (noticeable throughout Scandinavia) to remove Latin from the earliest stages of the curriculum of secondary schools, and to postpone the beginnings of classical study till the pupil is about fifteen or sixteen years of age; and (3) the practice of subsidising private effort in education on condition of government inspection attesting efficiency.

The people's high schools take advantage of the long winter leisure to hold their courses. There are also, in consequence of the population being entirely rural, and therefore scattered, peripatetic schools. Full details of the Swedish system in all its ramifications are given, and there is a note on Swedish children's workshops, as is most fitting when dealing with this, the home of sloyd.

Nobel, the inventor of dynamite, who left his mammoth fortune to be competed for by scientists and literary men, has given Sweden Nobel Institutes and Special Funds that contribute largely to the educational progress of his native land. Everybody knows of the five great prizes, each of the value of £8,000, that are given yearly for the most important discoveries in physics, chemistry, and physiology or medicine, and for the most remarkable literary work of an idealistic tendency. Particulars of the prize schemes are given, but it is claimed that the institutes and the special funds are likely to do as much good as the five great prizes.

The Training of Secondary Teachers in Switzerland.—This is one of the most interesting chapters in the volume, since, to quote the report, "it may be safely asserted that in no country in Europe is the importance of training for the teacher more clearly recognised than in Switzerland, as will be at once apparent when we state that this little country, with an area about twice that of Wales, and a population of about three millions, had, in 1895, no fewer than forty-two state or private training colleges. The course is from two to four years, classes are small (never more than twenty-five), and pedagogy is the most important subject of the curriculum. Students do not, as a rule, pay fees, the total income from this source being not more than £1,400 per annum."

The position of the Swiss teacher, who, if not passing rich, is at least comfortable on his £40 a year, with his right of appeal and his admitted claim to the respect of the community, is not by any means an undesirable one. His lines, as the report puts it, are "not cast in unpleasant places."

Salary Payable after Death.—Especially notable is the following:—"In the greater number of cantons the salary does not at once cease when a schoolmaster or schoolmistress dies, but continues to be paid in full to the teacher's heirs (fancy a teacher with heirs!) for a longer or shorter period." There is also a pension for the worn-out teacher, varying, in Canton Zurich, for primary teachers, from £4 to £40; of higher primary teachers, from £20 to £56; and of secondary teachers, from £40 to £120,—which sums, in the towns of Zurich and Winterthur, are considerably supplemented by contributions from the towns, so that primary teachers get from £76 to £100, and higher primary teachers up to from £88 to £100: all of which goes to show that England has much to learn from the land of Tell in respect to both the training and the treatment of teachers.

Summary of a Swiss Teacher's Training.—He spends six years at a primary school, three years at a *Sekundarschule*, and then, at the age of fifteen, enters a training college, where, for at least two years more, his general education is continued, and only at the age of seventeen does he begin to teach.

Zurich the Model of Co-ordination.—The Swiss section concludes with a glowing account of the Zurich system of schools, from which we regretfully turn through lack of space for adequate quotation. Suffice it then to state, in the words of the report, that the system is a model of co-ordination such as we hope may eventually obtain in this benighted land of ours.

Parisian Infant Schools.—The account of the development of the French *école maternelle* from the *salle d'asile* is clear if not convincing. Summed up, it means that French teachers, with their women servants as helpers, look more particularly after the feeding and cleaning of their baby charges than we are wont to do in our infant schools, but in the matter of education the English infant school is easily first all along the line. The Goodrich Road (London) time-table is compared with that of the official Parisian time-table, both being quoted in full, and a tribute of respect and admiration is paid to Mlle. Depoully of the Rue des Martyrs School.

Holland.—By far the most interesting part of the well-written report on Belgian and Dutch educational development is that referring to the Act of July 1900, which made education compulsory in Holland. It is curious to note in this connection that the Dutch, like ourselves, recognise a conscientious objector, only in their case it is education and not vaccination that is the subject of the objection. "When parents have an overmastering objection to the instruction given in all the primary schools within a certain distance from their homes, and their written declaration to this effect has been countersigned by the school inspector of the *arrondissement*, they may be exempted from the obligation imposed by the Act." We know more than one English family, alas, to whom such a clause would be a perfect godsend.

Portugal.—"Every parish has an elementary school for each sect.....In thickly-populated districts.....central schools are established, each of which forms a group of four graduated classes, with a separate master for each class. Where local circumstances prohibit the establishment of a permanent school, temporary or peripatetic classes for instruction in reading, writing, arithmetic, and religious doctrine may be held as a substitute."

There is no permanent inspecting staff, and no regular inspection of the schools, but extraordinary inspections are held from time to time at the discretion of the Minister.

The books to be used in all schools are prescribed by the Government; and severe penalties, extending even to revocation of their certificates, are imposed on teachers who introduce any but officially-sanctioned works into their schools. There are 4,492 primary teachers, of whom 2,592 are women.

Free evening continuation classes are held at the schools for men, and for boys over twelve.

Hungary.—A most interesting and exhaustive report is that on Hungary by Miss Dodds, who is well known to readers of THE PRACTICAL TEACHER. She gives a history of the Hungarian nation, more especially from the standpoint of the struggle for the vernacular, which even now has not ceased, and passes on to consider, from various points, the Act of 1868. School buildings and subjects of instruction next pass under review, after which come kindergarten, secondary education (which is exhaustively dealt with), State control of schools (also in full detail), and, by way of conclusion, there follow four useful appendices concluding with a letter from Dr. Emil Reich (who says the young educated Hungarian is a tadpole, all head and no body, and infinitely less preferable than the Englishman with his preponderance of body), elementary school statistics, age of pupils in secondary schools, and a bibliography which bears eloquent testimony to the judgment and industry of the compiler.

Latin.—Old Hungarians still occasionally address English strangers in Latin. "More than once friendly Hungarians, ignorant of German, whom I have met on a Danube steamer, have described to me the fortresses and cathedrals on the banks of the Danube in the Latin tongue. Once a tram-conductor, whom I addressed in German, replied in Latin, and asked me to use that tongue."

Some Good Points in the Hungarian System:—

1. There is no religious difficulty.
2. Teachers become inspectors, etc., in good proportion.
3. Examinations are chiefly oral.
4. All grades of teachers are carefully trained.
5. Teaching is a profession, and women are on an equality with men.
6. The teaching is largely humanistic.
7. Attendance is excellent.
8. The children have amazing retentive power, intense patriotism, an extraordinary facility for acquiring languages, and charming manners.

We regret that space will not permit us to further follow Miss Dodds's very interesting and exceedingly well-written report.

Servia.—The law of July 1898 gave Servia a school system, comprising primary, higher primary, and higher schools. The whole country is divided into nineteen school areas, governed by a board consisting of—(1) the prefect of the county, (2) the county doctor, (3) an engineer, and (4) a delegate from each district. Attendance is compulsory until the age of fifteen for boys and thirteen for girls.

Teachers must be trained, and women teachers must be unmarried, *unless they are the wives of masters.* There is a pension scheme, and the whole school system is, on paper at least, a very creditable one.

Commercial Education in Japan.—The Japanese have been so impressed by the race for wealth run by the Westerners with whom they have come into contact, that they have set up a complete system of commercial schools as the best educational equipment. This is discussed in an interesting paper, especial attention being given to a somewhat unusual sub-division of commercial doctrine—namely, that dealing with commercial morality. Some very nasty things might be said concerning the omission of this subsection by English educationists, whom the writer of the article lets down very lightly in speaking only of the strangeness of the omission.

The Study of Arithmetic in Elementary Schools.—This paper is by a well-known enthusiast—Mr. A. Sonnenschein—and, although not startling in its novelty, will be read with interest by teachers in general. But as the elements of arithmetic are taught much better in elementary than in secondary schools, it would have been better to substitute "secondary" for "elementary" in the heading.

Languages.—Mr. Hart advocates teaching, in grammar and other schools, French first of all, then German, and finally, at the age of thirteen, Latin. We believe the reform would be a wise one, if adopted universally.

Mr. E. A. Sonnenschein begs for the teaching of Latin on the basis of the New Method, which looks first of all to a vocabulary got by means of conversation, and the gradual acquirement, by induction, of grammar just when it is wanted. We commend this as altogether wise and prudent.

Mr. James Mortimer puts in a plea for a great agricultural school, and gives some interesting details in support thereof. He is followed by Messrs. Campagnac and Russell, who give some sad details concerning the boy traders (or rather boy slaves) who trade in the streets of Manchester, and whose state of slavery will shortly occupy the attention of Parliament. All teachers know only too well the burden thus placed upon these young shoulders, and pray that the time may soon come when school and play and sleep shall absorb the whole of the schoolboy's life.

We have only space left to merely mention the two last reports—namely, those dealing with the South African Republic and the teaching of Asiatics. The former will be especially interesting to those who have gone out to take over the work begun in the Transvaal under the old *régime;* and as to the Asiatics, it is of interest to note that the Direct Method of teaching modern languages is being already utilised to teach them English.

And now, leaving Volume IX. to be dealt with in our issue for July, we bring these fugitive lines to a close, in commending our readers to Mr. Sadler's truly interesting and encyclopædic volume for further information with respect to the topics the surface of which we have all too briefly skimmed.

THE NEW CODE.

TIME was when the appearance of the Code was anxiously expected by the whole educational public; every one was anxious to know what changes would be introduced, what alterations it would make in the syllabus for different subjects, and what new matters it would recognise as legal. But this year the issue of the Code has excited hardly any interest at all.

Perhaps the Code has been shorn of its importance by the Cockerton decisions, which show that the Code is not law, and may even encourage School Boards and other bodies to carry on work that is distinctly illegal when tried by the formal rule of the law. Again, the publication of a separate Code for evening classes further detracted from the importance of the Code as a guide to general school policy, while its importance in matters of detail was diminished when teachers were left free to draw up their own syllabuses, and the schedules regulating the instruction in different subjects were withdrawn. Thus it is that the Code of 1902 makes its belated appearance, and if any one turns his attention to it from the all-absorbing topic of the Bill, it is to wonder why it has taken the trouble to appear at all. Apparently it has been in hand some time, for an average man of business would marvel that a document which is issued in May 1902 should gravely inform pupil teachers that "in 1902 the examination will be on April 26."

The Code Committee has evidently given careful consideration to the matters before it, and is probably not responsible for the delay.

Apparently, in view of the great changes that may result from the passage of the Education Bill, the changes introduced into this year's Code are few and not of great moment. Effect is given to the judicial decision that instruction given to persons above fifteen years of age is not a part of "elementary education;" for "from and after April 1, 1903, no attendance may be reckoned for any scholar under three or over fifteen years of age." This is a matter of great importance.

Other alterations are introduced which affect pupil teachers. These are in most cases a result of the abolition of the annual collective examinations. The rules respecting the sex of pupil teachers in relation to that of their head-teachers and scholars is made to apply to probationers; but, of course, any one could see before that probationers must be affected by the spirit of rules in such cases, even if the letter did not touch them. The provision that the apprenticeship may begin on January 1 has again been introduced, and this we think a wise one. We agree with the wisdom of making the training-college year begin in September, like that of the universities; and think that the scholarship examination should be held about the end of June, leaving an interval of three months between the two parts of a teacher's training. But as the Board of Education considers it better to leave the young people nine or ten months with nothing particular to do, those in charge of pupil teachers will much prefer an arrangement which will fix the scholarship examination at the end of the apprenticeship, and not, as at present, either six months before or six months after. The substitution of one of the examinations in Schedule IV. for the King's Scholarship for those who desire it has now been completed. This recommendation of the Departmental Committee has been introduced in three stages: first, the training-college authorities were allowed to accept such examination in lieu of Scholarship; but if a pupil teacher matriculated, he was also required to take the Scholarship as his final examination. Last year relief was afforded to the pupil teacher by not obliging him to take the Scholarship examination as well as the other, but at the same time his managers could not claim the £5 grant unless he did so. This year the grants specified in Art. 102 will be paid if the pupil teacher "has in lieu of such examination obtained a good or fair report from the inspector," and presumably such report will be earned by those who pass one of the examinations in Schedule IV. The new rules for examinations for teachers' certificates which have been discussed in THE PRACTICAL TEACHER are now incorporated in the Code. A note over the syllabus for pupil teachers states that it may be varied by the managers, with the approval of the inspector, in any case. This is no doubt intended to enable those pupil teachers who wish to work on university lines to follow a syllabus leading up to the matriculation or preliminary examination of their university; but others will no doubt be glad of the opportunity of modifying the curriculum in English so as to make a more satisfactory study of literature, or may consider it advisable for girls to study some elementary mathematics, especially as the subject may be taken in the Scholarship examination.

OUR CLASSROOM AIDS.

KINGS AND CROWNS.

"Ay, every inch a king."—*King Lear.*

[The coronation of King Edward the Seventh is an event of modern history, and, as such, will no doubt form the subject of one or more lessons in nearly every school. We feel, therefore, that our readers will be glad of material on which to base such lessons, and trust they will find the matter of the following article of use.]

THERE is no office or title that can lay claim to greater antiquity than that of king. In the very dawn of history, when Abraham wandered on the plains of Mesopotamia, we find kings warring against kings; indeed, the history of the patriarchs and of the chosen race furnishes us with a striking example of the evolution of the single family, ruled by its patriarch or oldest member, into the great nation governed by a king—that is to say, the gradual growth of the monarchal from the patriarchal form of government.

In our own country kings have ruled from prehistoric times—

> "For many a petty king, ere Arthur came,
> Ruled in this isle, and ever waging war
> Each upon other, wasted all the land."

It is, however, from our Saxon forefathers that we obtain the title of king (Anglo-Saxon, *cyning*), and to them we owe the fundamental principles that govern the relation between king and people.

Among the Anglo-Saxons the king was chosen by the Witan, or Great Council of the Nation, which every freeman had the right to attend, and no important act of the king was valid without consent of the Witan. Not only had the Witan the right of choosing the king and controlling his actions, but also of deposing him if he refused to act according to their wishes. "Six times at least," says Professor Freeman, "in the space of nine hundred years, from Sigeberht of Wessex to James the Second, has the Great Council of the Nation thus put forth the last and greatest of its powers. The last exercise of this power has made its future exercise needless. All that in old times was to be gained by the deposition of a king can now be gained by a vote of censure on a minister, or, in the extremest case, by his impeachment." This glorious birthright of the people, the right to choose their own king and to control his actions, was in great danger of being lost at the time of the Norman Conquest. Although William the Conqueror received his throne from the Witan, and promised to govern according to the laws of Edward the Confessor, he was not slow to take advantage of the power which the Feudal System placed in his hands; and by skilfully handling the different grades of society, and balancing them one against the other, he made himself practically an absolute monarch.

But although for a time the sturdy Saxon had to forego his rights, he did not forget them; and when, on the separation of England and Normandy, the Norman nobility threw in their lot with the Saxon peasantry, there commenced that long struggle which lasted from the time when that first Great Charter was wrung from the pusillanimous John, down to that glorious Revolution which sounded the death-knell of the fatal doctrine of divine right, so dear to the Stuarts, and laid the foundation of that happy relation between sovereign and subject which existed during the reign of our late beloved Queen, who, in the words of Tennyson,

> "Kept her throne unshaken still,
> Broad-based upon her people's will."

Let us now consider what is the position of the sovereign at the present time. We have seen that the royal power is held, not by divine right, but by the will of the people. Our present dynasty was accordingly fixed by the representatives of the people during the reign of William the Third, when by the Act of Settlement the sovereign power was settled on the "heirs of the Princess Sophia of Brunswick, being Protestants." This then establishes the important point that the crown can only be worn by a Protestant, and furthermore it states that, should the sovereign marry a Roman Catholic, the crown would be forfeited by that act.

The sovereign possesses many rights, which constitute what is known as the Royal Prerogative, the chief of which may be briefly stated as follows:—The person of the sovereign is sacred, and he is above all law, no Act of Parliament being binding on him unless it contains express words to that effect; the sovereign alone possesses the power of declaring war or making peace; he is the head of the State, the Church, the Army, and the Navy; he grants all titles and distinctions, orders of knighthood, military decorations, etc.; finally, his assent is necessary to all Acts of Parliament before they can be placed on the Statute Book, although he has no direct voice in discussing them. Such then are the rights and privileges of the sovereign; but when Parliament conferred these rights, measures were taken to prevent their abuse. For this end the House of Commons, as representing the people, reserved to itself the control of the finances of the country; so all Bills involving the levying or removal of taxes, or the appropriation of such taxes, must originate in the House of Commons, and must be either rejected or accepted without amendment by the lords and the sovereign. Thus, although the king has power to declare war, it would be futile for him to do so without the approbation of his faithful Commons, as he must look to them to provide the "sinews of war." Again, although the king, as head of the army, has absolute control over it, the very existence of the army depends on Parliament, authority to maintain a standing army being granted by the Army Discipline Act (formerly called the Mutiny Act), which regulates the number of men to be employed, the terms of enlistment, and the manner in which discipline shall be maintained. Moreover, this authority is granted only for one year, the Act being renewed annually. This, together with the necessity of passing the Budget, ensures that Parliament shall be summoned at least once a year.

It may be urged that rights which are hedged about by

restrictions in this manner become mere empty forms, and, like the wooden sword of the jester, instead of adding dignity, only excite derision. That this is not so, however, was strikingly illustrated during the last reign, when, in 1870, Mr. Gladstone wished to abolish the system of obtaining commissions in the army by purchase, and to make promotion depend on merit, not on money. When the Bill for carrying out this reform was introduced into Parliament, it met with such bitter opposition in both Houses that it was evident it could not be carried, so Mr. Gladstone adopted the bold course of asking the Queen to carry out this reform by the exercise of the Royal Prerogative, which she accordingly did. Thus we see that, although many of the rights of the crown are seldom exercised, they are not mere empty forms; for should occasion arise when they can be used for the good of the nation, the sovereign would not hesitate to so use them, knowing that his action would receive the approbation of his people.

The king, as was previously stated, has no power to raise money in any way, but must look to Parliament for all that is necessary for the support of the royal household and upholding the dignity of the crown.

On the accession of a sovereign, Parliament fixes the amounts to be paid annually to the king and the various members of the royal family. This allowance is called the Civil List. The amount settled on our present sovereign is £470,000, to be paid annually, and is appropriated as follows:—

Privy Purse	£110,000.
Salaries of Household	128,000.
Expenses of Household	194,000.
Royal Bounty	33,200.
Unappropriated	4,800.

The revenues of the Duchy of Lancaster belong to the king, not as sovereign of England, but as Duke of Lancaster, Henry the Fourth having carefully provided that his property as Duke of Lancaster should not be amalgamated with the crown property.

Having thus briefly considered the title and office of king, we will now deal with the rites and ceremonies observed at a royal coronation.

The coronation, as we have already seen, is not essential to the assumption of the kingly office. On the death of a sovereign, the heir succeeds to the title under the Act of Settlement without any ceremonial being necessary. But although not essential, the importance of the ceremony cannot be overestimated, since its two aspects—the religious and the legal—serve in a twofold manner to strengthen the position of the sovereign in the hearts of his subjects: the religious part by setting forth the sacredness of the person and office of the king; the legal and purely ceremonial portion by showing the dignity and antiquity of the office; whilst, on the other hand, the necessity of governing according to the laws is brought home to the sovereign most emphatically by the coronation oath.

In very early times there appears to have been no fixed place for the coronation, although most of the Saxon kings were crowned at Kingston-on-Thames, where the huge block of stone which served as the coronation-stone for at least seven kings is still carefully preserved. Edward the Confessor was crowned at Westminster Abbey; and although, in the Bayeux tapestry, Harold is represented as being crowned at St. Paul's, this is probably a mistake on the part of the industrious ladies who are responsible for the production of that interesting work of art.

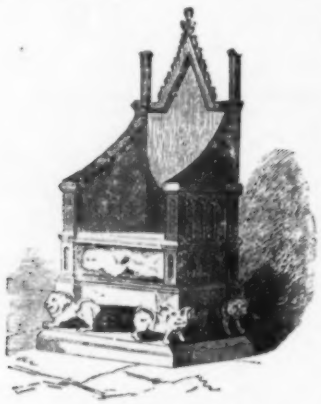
Winchester claims to have been the scene of several coronations; but although it was formerly the capital of England, the only coronation taking place there of which we have any record appears to have been that of Richard the First, who, although originally crowned at Westminster, was recrowned at Winchester after his return from long captivity.

WESTMINSTER ABBEY.

Westminster Abbey then has been the scene of the coronation since the time of Edward the Confessor; and what more suitable spot could be found for such a ceremony? Here the latest of a long line of kings finds himself following in the very footsteps of his predecessors—treading the selfsame path to the throne as the most illustrious of his ancestors; whilst the sight of the tombs on either hand must excite mingled feelings of pride and humility—pride as he reads on many of them the names of those who have done so much to raise this country to the proud position she now holds, and humility as he sees on some the names of kings themselves, being thus reminded at the very moment of receiving the crown that

> "Within the hollow crown
> That rounds the mortal temples of a king
> Keeps Death his court."

In that part of the Abbey known as Edward the Confessor's Chapel is to be seen the Coronation Chair and Stone, on



CORONATION CHAIR.

which have been crowned every sovereign since Edward the First, with the exception of Queen Mary, who used a chair specially blessed and sent to her by the Pope. Most interest perhaps is attached to the stone, which was brought from Scone by Edward the First, where it had long been used at the crowning of Scottish kings. According to tradition, this is the identical stone that Jacob used for a pillow when fleeing from Esau; and further, the legend ran that wherever this stone was deposited Scottish kings would be crowned; and belief in this legend is said to have been the means of reconciling many of the Scots to the union of the crowns. The chair itself is of solid oak, and was made by Edward the First after the pattern of the Scottish chair in which the stone was originally kept at Scone. The stone rests on a shelf below the seat, and at the base of the chair are four small lions rudely carved.

Before dealing with the ceremony itself, let us consider the Regalia of England. Of the crowns which figure in the regalia the oldest is St. Edward's crown. This was made for the coronation of Charles the Second, to replace the one which was broken up, together with the rest of the regalia, during the Commonwealth.

The Imperial Crown consists of a gold band with an ermine border, richly studded with precious stones, from which rise two arches composed of oak leaves, each having a Maltese cross at its base; between the arches are fleurs-de-lis, and the whole is surmounted by a globe and cross, and lined with a velvet cap. The number of jewels in this crown is shown in the following list:—1,363 brilliant diamonds, 1,273 rose diamonds, 147 table diamonds, one very large ruby irregularly polished, 17 sapphires, 11 emeralds, 4 smaller rubies, and 277 pearls. The other crowns are: the Queen Consort's Crown; the Queen's Diadem, a circlet of gold, made for Marie d'Este, the wife of James the Second; and the Prince of Wales's Coronet, which is made of fine gold, without jewels of any kind. There are several sceptres included in the collection.

The Royal Sceptre, or Sceptre with the Cross, is the one which is placed in the right hand of the sovereign at his coronation. It is made of gold, and is 2 ft. 9 in. long; the hand is plain, and the upper part wreathed; it is ornamented with emeralds and diamonds, and is surmounted by a globe and cross, the globe being made of a magnificent amethyst.

The Sceptre of the Dove is also of gold. It is 3 ft. 7 in. in length, and is surmounted by a cross, sustaining a dove with outstretched wings.

The Queen Consort has two sceptres also: one, known as the Sceptre with the Cross, is of gold, and somewhat resembles the Royal Sceptre; the other is the Ivory Rod, made for Marie d'Este.

There is also another sceptre, which was discovered in 1814 on a shelf in the Jewel House, covered with dust. This is of elegant workmanship, and is supposed to have been made for Queen Mary, wife of William the Third.

St. Edward's Staff, which is carried before the sovereign at the coronation, is a gold rod 4 ft. 7 in. long, with a steel foot and a mound and cross at the top.

The Ampulla or Golden Eagle is used to hold the consecrating oil. The head screws off, somewhat like the top of a pepper-box, for convenience in filling, but when in use the oil is poured out through the beak. It is nine inches high, and measures seven inches between the points of the wings.

The Spoon is of silver, heavily gilt, and contains four large pearls in the handle.

The Orb or Globe is a golden ball, six inches in diameter; it is surrounded by a band embellished with precious stones, whilst on top is a remarkably fine amethyst, which forms the foot or pedestal of a gold cross three inches high, bringing the total height to eleven inches.

There are four swords—(1) the Curtana or the Pointless Sword of Mercy, a fine blade 32 inches long, in a rich brocaded scabbard; (2) the Sword of State, a large two-handed sword, having a crimson velvet scabbard; (3) the Sword of Justice to the Spirituality: and (4) the Sword of Justice to the Temporality.

The Bracelets are of fine gold; they are $1\frac{1}{2}$ inches in breadth and $2\frac{1}{2}$ inches in diameter.

The Golden Spurs are the emblems of chivalry; they are curiously wrought, and are what is known as "prick-spurs"—that is to say, they have no rowels, but end in a point.

The Ring used at the coronation is of plain gold, and contains a large table ruby, on which is engraved a St. George's cross.

Visitors to the Tower, as they peer through the iron rails at the jewels, might naturally think that these at least were secure from that terror of the suburban householder—burglars. Yet in 1671 a daring attempt was made by one Colonel Blood to carry off the crown jewels. Although the attempt was unsuccessful, Blood managed to overcome the keeper of the jewels, and to actually obtain possession of the crown; but the alarm was given, and he was pursued and captured with the crown still hidden under his cloak.

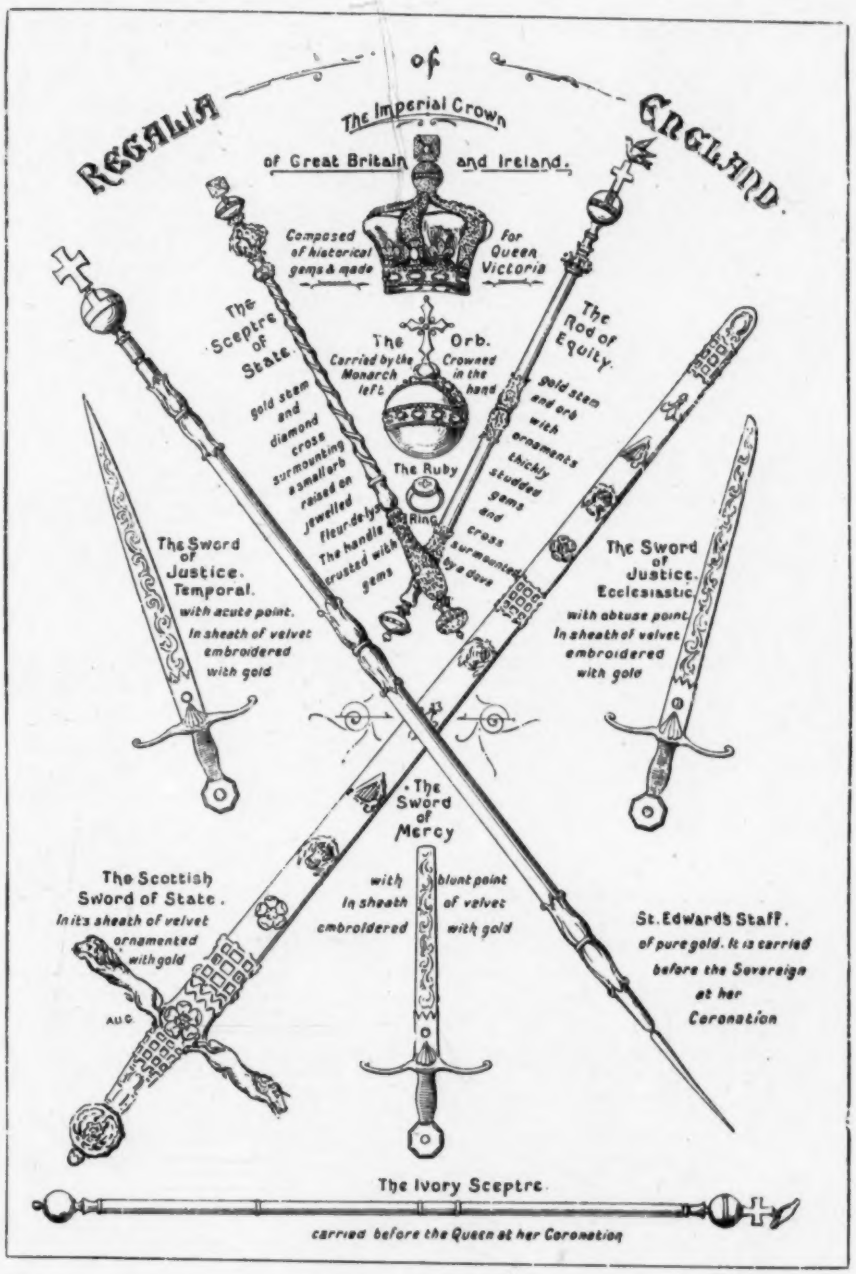
In 1841 a serious fire broke out in the Tower, and great difficulty was experienced in rescuing the jewels, as the keys of the iron gratings which protect them were kept, not in the Tower, but at the office of the Lord Chamberlain.

Turning to the coronation ceremony, the two most striking incidents, except the actual placing of the crown on the head of the sovereign, are the Anointing and the Administration of the Oath.

The ceremony of anointing is of extreme antiquity, and was intended to signify that the person or thing thus anointed was dedicated or set apart for some special purpose. Thus we find Jacob anointing the stone on which he slept, when he set it up as a memorial; and, again, we read that Moses anointed the tabernacle and all that it contained, when, on its completion, it was dedicated to the service of the Lord. The Hebrews, who probably copied the ceremony from the Egyptians, anointed not only kings but also their priests; whilst the degree of sanctity which they deemed to be conferred by this right is shown by the words of David to the Amalekite that slew Saul: "How wast thou not afraid to stretch forth thy hand to destroy the Lord's anointed?"

The earliest record of anointing in England is found in the accounts of the coronation of Ethelred the Second, who was anointed on the head; but at subsequent ceremonies the sovereign was anointed on three, five, or even seven places. At the last coronation the Queen received the sacred unction on her head and on the palm of her hand; but the orthodox method of anointing is, apparently, to touch the head, the breast, and the arms, as being the respective repositories of the three regal attributes—glory, sanctity, and strength.

The Oath represents the *legal* phase of the coronation, the king being required to swear that he "will govern the people of this kingdom of England and dominions thereunto belonging according to the statutes in Parliament agreed on, and the laws and customs of the same;" and further, to "maintain the laws of God, the true profession of the


REGALIA of ENGLAND.
The Imperial Crown
of Great Britain and Ireland.
Composed of historical gems & made for Queen Victoria
The Sceptre of State
gold stem and diamond cross surmounting a small orb raised on jewelled fleur-de-lys
The handle trusted with gems
The Orb.
Carried by the Monarch left
Crowned in the hand
The Ruby Ring
The Rod of Equity.
gold stem and orb with ornaments thickly studded gems and cross surmounted by a dove
The Sword of Justice. Temporal.
with acute point.
In sheath of velvet embroidered with gold
The Sword of Justice. Ecclesiastic.
with obtuse point.
In sheath of velvet embroidered with gold
The Sword of Mercy
with blunt point
In sheath of velvet
embroidered with gold
The Scottish Sword of State.
In its sheath of velvet ornamented with gold
St. Edwards Staff.
of pure gold. It is carried before the Sovereign at her Coronation
The Ivory Sceptre
carried before the Queen at her Coronation

gospel and the Protestant Reformed religion established by law."

Before taking the oath, the sovereign is required to make the Declaration, wherein he is required to formally deny the doctrine of Transubstantiation, and to declare Masses and the adoration of the Virgin Mary to be superstitious and idolatrous. This is done in order to publicly demonstrate the fact that the future king satisfies that part of the Act of Settlement which expressly states that the sovereign must be a Protestant.

Some attempt has been made for the forthcoming coronation to soften down the terms of this declaration, as being unsuitable to this age of religious toleration, it being admitted by most people that it is possible for the king to make the necessary profession of faith without wounding the feelings of his Roman Catholic subjects.

The following outline of the ceremony observed at the coronation of Queen Victoria will serve to indicate the order of the proceedings. The Queen was received at the door of the Abbey by the Dean and Prebendaries of Westminster, who then headed the procession up to the throne. Before receiving the crown, however, the sovereign does not mount the throne, but uses a chair of state placed at the side. Here, then, the Queen took her seat, with the Bishop of Durham and the Bishop of Bath and Wells as supporters on either side, the four sword-bearers on her right hand, and the Lord High Constable and the Lord Great Chamberlain on her left, whilst other officers and nobles, bearing the regalia, stood near. The first offering, consisting of an altar-cloth and a wedge of gold, having been made, the sermon was preached by the Bishop of London, after which the Archbishop of Canterbury administered the Oath. During the singing of the anthem, the Queen, attended by her supporters, and preceded by the Sword of State, went to the altar, where she divested herself of her crimson robe, preparatory to taking her seat in the Coronation Chair. When she was seated, the Dean of Westminster took the Ampulla and Spoon, and having poured some of the consecrating oil into the Spoon, handed it to the Archbishop of Canterbury, who anointed the Queen by making the sign of a cross upon her head and the palm of her hands. Next were presented the Spurs, which were forthwith returned to the altar, together with the Sword of State. The Queen was then invested with the Royal Robe of Cloth of Gold; and the Orb and Sceptre having been presented to her, the climax was reached by the archbishop placing the crown reverently upon her head. This was the signal for the peers, who up to this point had been bareheaded, to put on their coronets.

> "Soon as the royal brow received the crown,
> Straight on a thousand coronets we gaze—
> Straight all around was one imperial blaze."

This glittering scene was followed by the ceremony of homage. During the singing of the *Te Deum* her Majesty ascended the throne, and each peer advancing in turn, removed his coronet, and, stretching out his hand, touched the Royal Crown, then knelt and kissed her Majesty's hand.

This being ended, the Holy Communion was administered, and the whole ceremony brought to a conclusion by the benediction pronounced by the archbishop.

This order will most probably be followed in the forthcoming coronation, with the following modifications:—

1. The ceremony of the First Oblation to be omitted.
2. The Homage to be abbreviated by the limitation of the personal act to the senior peer of each degree.

No account of the coronation ceremony would be complete without mention being made of some of the curious offices and quaint services attending it. These are extremely interesting as serving to illustrate the manners and customs of bygone ages. Many of these offices are hereditary, the performance of them having been originally imposed as one of the conditions on which the vassal held his estate.

The most important hereditary office is that of Earl-Marshal, which is held by the Duke of Norfolk. It is his duty to publish the arrangements for the coronation, and to superintend the carrying out of the same.

The right of crowning the sovereign is claimed by the Archbishop of Canterbury, for which he receives as fee the chair, cushion, and footstool used by him during the ceremony; whilst York claims the right of crowning the Queen Consort. The Bishop of Durham and the Bishop of Bath and Wells claim jointly to assist in supporting the sovereign in the coronation procession.

The Lord Great Chamberlain is the Marquis of Cholmondeley; and his fee includes the bed and bedding on which the king slept the night before the coronation, the furniture of the bed-chamber, together with the king's wearing apparel.

The office of Royal Herb-Strewer reminds us of the time when rushes and leaves were used for the floors of even the richest in the land.

Of all the offices, the most strikingly picturesque is that of King's Champion. Here we have a relic of mediæval times, when every man upheld his honour with his sword.

Up to the time of George the Fourth it was customary for the champion to ride into the hall during the banquet and proclaim that if any person deny the right of the King to the Imperial Crown "he lieth, and is a false traitor;" and that he, the King's Champion, is "ready in person to combat with him, and in this quarrel will adventure his life against him on what day soever he shall be appointed."

This office, which has been held by the Dymoke family for many generations, appears likely to become extinct. No champion appeared at either of the last two coronations, as there was no banquet on either occasion, and he will probably not be called upon to don his armour on behalf of King Edward, for a similar reason.

After all, it is only natural that these old customs should die out, for coronation ceremonies, like everything else, change with the times. One can hardly picture King Edward the Seventh proceeding to his coronation in the same manner as the earliest Edward, the son of Alfred the Great, who, we are told, "was elevated on a stage or target, and carried on the shoulders of his men, being from time to time, in their enthusiasm, tossed in the air, until they arrived at the door of the church." Neither would it be wise to repeat the scene at the coronation of Edward the First, when, according to Holinshed, "there were let goe at libertie (catch them that catch might) five hundred great horses of the King of Scots, the Earles of Cornwall, Gloucester, Pembroke, Warren, and others, as they alighted from their backs."

The kindly thoughtfulness of our present King in enabling the poorest of his subjects to participate in the general rejoicings, commends itself to all our hearts, and may be taken as an earnest of his desire to follow in the footsteps of his mother, our late beloved Queen, and to establish the throne more firmly still in the hearts of a loyal people.

Coronation Music. (J. Curwen and Sons) This energetic firm has provided an excellent selection of music for the coronation season. Choral societies possessing a good orchestra would find *Life for the King* (Glinka) very effective, whilst Oakey's edition of Handel's coronation anthem, *The King shall rejoice*, is an inexpensive but thoroughly reliable one. Both day and Sunday schools are provided with a capital selection of special hymns and songs, the hymn, *O King of kings* (Fox), and the unison song, *One King, one Flag, one Fleet* (Myles Foster), being exceptionally taking.

The *Coronation Drill* (Windley and Stuart) would form a very attractive item in a school entertainment, and should be borne in mind when the entertainment season comes round.

The Annual Exhibition of work executed in the Board Schools of London will be held at the Examination Hall, Victoria Embankment, W.C. (adjoining Waterloo Bridge), on Wednesday, 18th June, 1902, and the three following days. The exhibition will be opened by Lord Reay, G.C.S.I., G.C.I.E. (chairman of the Board), at three o'clock p.m., and will include specimens of work from all classes of schools under the Board. There will also be included scientific apparatus which has been constructed by the teachers and pupils.

It is hoped that the people of London will take this opportunity of inspecting the remarkably good work done in their schools.

NOTES OF LESSONS ON THE CORONATION.

I. FOR STANDARDS VI. AND VII.

Time.—As the subject embraces so many points, it will require three or four lessons to deal with it thoroughly.

Objects.—1. To enable the children to take an intelligent interest in what they will hear and read of the coronation ceremony.

2. To awaken a more lively appreciation of the study of history by showing the influence of the past upon the present.

Apparatus.—Pictures of the Regalia, the Coronation Chair, Westminster Abbey, etc.

MATTER.	METHOD.
A. **The King.**—1. *The necessity of having a King.* Whenever people live together in communities, or work together in any way, it is necessary to have a recognised leader.	Illustrate this point by reference to the captain of a cricket or football team, the foreman in a workshop, etc.
This leader may be selected in two ways :— (*a*) In a republic, the leader, or president, is elected for a certain number of years.	Let the children give the names of a few republics, and remind them of the time when England was a republic.
(*b*) In a monarchy, the office of ruler is hereditary. 2. *The Sovereign of England.* England is sometimes spoken of as a Republican Monarchy; for although the office is hereditary, the king is chosen by the people, and only holds his office under certain conditions, which have been laid down by the people.	Illustrate this point by taking examples from history in which the next heir has been passed over in favour of a more suitable monarch—for example, the sons of Edmund being too young to lead the people, his brother Edred was chosen to succeed him.
3. *The Act of Settlement.* Our present line of sovereigns was chosen during the reign of William the Third, by the Act of Settlement.	
B. **The Coronation.**—1. *The Objects of the Coronation :—* (*a*) By its splendour to uphold the dignity and majesty of the sovereign.	Show that the coronation is not essential to the assumption of the kingly office, for Edward the Seventh has already reigned nearly eighteen months.
(*b*) By its rites and ceremonies to remind us of the glorious traditions that have come down to us from our forefathers. 2. *The Splendour.* In former years the coronations were marked by gorgeous processions and extravagant banquets, but since the coronation of George the Fourth (which was the most extravagant on record) the procession has been curtailed.	The banquet at the coronation of Edward the First was so sumptuous that special kitchens had to be built to prepare the dishes.
The scene in the Abbey is brilliant beyond description: the king and queen in their royal robes of cloth of gold, the bishops in their vestments, and the peers and peeresses in their court dresses, form a scene of dazzling splendour. 3. *The Rites and Ceremonies.* (*a*) *The Recognition.* On reaching the Abbey, the king proceeds to the Chair of Recognition, and the people are summoned by the Archbishop of Canterbury to recognise him as their undoubted king.	Show that this is no mere form, but a valuable ceremony which has come down to us from very early times, and shows that the king is chosen by the people now just as much as he was then.
(*b*) *The Oath.* Having been hailed as king by the people, he next makes the *Declaration*, and takes the *Oath*. In the *Declaration*, the king declares himself to be a Protestant.	Show the reason of this declaration. The Act of Settlement requires that the sovereign shall be a Protestant, to prevent a repetition of the evils of James the Second's reign.
In the *Oath*, the king swears that he will rule according to the statutes of Parliament.	Show that this preserves the "freedom of the subject," which is one of the proudest possessions of an Englishman. Briefly recapitulate the chief points in the struggle, beginning with Magna Charta, by which that freedom was obtained.
(*c*) *The Coronation Chair.* The king now takes his seat in the coronation chair for the anointing and crowning.	Show picture of the Chair and Stone of Destiny. Remind the class how the stone was brought from Scotland by Edward the First, and of the legend attached to it.
(*d*) *The Anointing.* The oil is contained in a golden vessel shaped like an eagle, called the ampulla, from which it is poured into the anointing spoon.	Show the antiquity of the ceremony of anointing by referring to the anointing of Saul by Samuel.
(*e*) *The Crowning.* The king now receives the various articles that make up his insignia of office. These include the golden spurs, the sword of state, the ring, the orb, the sceptre, and finally the crown.	Pictures should be shown of the regalia, and a short description given of each article, and the significance of each pointed out. The spurs are the emblems of knighthood, and remind the king of his duty to protect the weak. The sword reminds us of the time when the king was the leader in battle, and also that he is still head of the army.
(*f*) *The Homage.* The king having been crowned, the peers have to advance to the throne and do homage. This is done by first touching the crown of the king, then kneeling and kissing his hand.	Compare this with the custom of feudal times, when each knight had to do homage to the king for the land which he held.

II. FOR INFANTS.

Time.—Thirty minutes.
Class.—Six years old.
Apparatus.—Pictures, flags, coins, photographs of the King and Queen.
Aim.—To assist the children in taking an intelligent interest in the great historical events of 1901-2, and to inculcate patriotism and loyalty.

MATTER.	METHOD.
I. The sad event of last year. Queen Victoria, who had reigned in England over sixty years, died in 1901.	What event took place last year which caused sorrow to all English people? How did people show their sorrow? Had Queen Victoria been Queen long?
Her eldest son, the Prince of Wales, became King Edward VII.	Who became King? What is done to the kings of England? Explain the word "coronation."
II. Preparations for the coming Coronation. 1. Invitations issued by the King.	Was the King crowned at once? Why not? When is he to be crowned? How have people been getting ready? What has the King had to do?
2. Ordering of robes and crowns. 3. Arranging dinners for the poor. 4. Street decorations.	What have the guests had to get ready? What is the King going to give to the poor?
5. Erection of seats and stands. 6. Naval review. Foreign ships coming over to take part.	What will be done to the streets in London? What kind of decorations? What are the stands for? How can people get a seat? How will the sailors rejoice? Will all the ships be British?
III. The Coronation Day. (*a*) *Scenes in the streets. Troops, police, crowds, etc.*	What will the streets look like on Coronation Day? Why are so many soldiers and policemen needed?
(*b*) *Scene in Westminster Abbey.*	Where is the coronation to take place? Briefly refer to the great age and beauty of the abbey. Who will see the coronation?
All who have been invited will go to the abbey to see the King and Queen crowned.	
The King will sit on a throne which has been used for many hundreds of years, and under the seat is a large stone, used long ago by the kings of Scotland.	Upon what will the King and Queen sit? Will the throne be new? Explain the presence of the stone under the seat.
There will be music and hymns and a short sermon, and the archbishops will anoint and crown the King and Queen.	What will happen in the abbey? Refer to the anointing of Saul and David. Who will put the crowns on the King and Queen?
After the crowning, the peers and peeresses will put on their coronets, and all those present will shout, "Long live the King!" "Long live the Queen!"	What will the people in the abbey shout?
(*c*) *The journey home.* After the ceremony, their Majesties will ride home in a grand procession.	What will happen after the service? Where will the King and Queen and their guests go?
IV. Procession on the following day. To enable their subjects to see their Majesties, etc., there will be a long procession next day through London.	When will the people of London see the King and Queen? Why will the procession be on the next day? What will the crowds shout and the bands play?
V. General rejoicing. 1. Feasting. 2. Fireworks. 3. Pealing of bells. 4. Firing of cannon.	How will people show they are glad?

NATURE-KNOWLEDGE.

LEAVES.

LEAVES present materials for many interesting lessons in a course of nature-study, and in addition they furnish excellent models for drawing, especially drawing in mass by the brush. The present article aims only at presenting the leading outlines of such groups of lessons, and the teacher will do well to fill in details from such forms as fall within the common experience of his own scholars.

Dealing with any single leaf, the points which emerge for treatment are its build, arrangement of stalk and blade, distribution of veins (venation), its shape, character of the edge, surface features, such as hairs, waxy bloom, etc., as well as the distinction between the upper and lower surfaces, also the division of leaves into lobes, leading up to compound leaf-forms. Then dealing with the leaves of a plant as a whole, or at least with those on a single shoot, we have to discuss the arrangement of leaves on a stem so as to get the maximum amount of light and air (phyllotaxis), the manner in which leaves are attached to the stem, and the methods by which the fall of a leaf is produced in autumn. The mention of autumn, again, suggests autumn tints and the whole subject of leaf-colour. The arrangement of leaves so as to modify the water-supply of a plant will also have to be observed, and in connection with this their physiological uses as regulators of perspiration or transpiration on one hand, and as assimilative organs on the other, concerned with the formation of starch and its transport to the stem for nutriment and storage. The several modifications of leaves have also to be noted—floral leaves, scale leaves, cotyledons or seed-leaves, as well as the ordinary foliage leaves; their modification into tendrils or thorns or insect-traps, as in sundew and milkwort; their functions in the way of food storage; lastly, their economic uses other than for food.

Take any large simple leaf, say that of a rhododendron or laurel, and examine it in detail. Notice the natural division into blade and stalk, the expanded foot or cushion by which the foot of the stalk is fastened to the stem, very well seen in a horse-chestnut leaf, with the arrangement for securing the autumnal fall of the leaf as a whole. In the case of a compound leaf like that of the horse-chestnut or Virginia creeper, observe that this arrangement for breaking off is repeated at the base of the leaflets as well, so that when the whole leaf falls it also falls

in pieces, as it were. Explain how this cut-off is secured by the formation at the base of the stalk of a layer of dead matter, and point out on a branch of horse-chestnut the leaf-scars showing where the stalks were inserted.

Now examine the blade of the leaf, and see how the stalk is continued up this as a main rib or midrib, with side branches. Note that the veins are lighter than the leaf-colour; brush-work pupils often paint the ribs darker than the body of the leaf, owing, doubtless, to the false analogy from outline drawing with a pencil. Note the names of these strands—ribs, veins, nerves, cords—each name having some argument in its favour. Rib suggests the ribs of our own body or of an umbrella, the latter for preference. Show the likeness between an umbrella and the leaf-blade—the silk corresponding to the softer green tissue, the steel framework to the ribs of the leaf. Note also that the leaf ribs are rarely round or square, but most commonly resemble the hollow "Paragon" ribs found in most umbrellas. The spread and distribution of these ribs in the larger and heavier leaves is to be watched, so as to bring out the fact that their object is to give the maximum of strength and support with the minimum of material and space. The name vein suggests, of course, our own blood-vessels; and here also there is a likeness, since these ribs are hollow, consisting largely of bundles of tubes (vascular bundles), which serve to carry water outwards to the leaves and sap inwards from the leaves to the stem. Show the presence of some of these vascular bundles in a stalk of rhubarb or celery, and if the school possesses a lantern, mount a thin cross-cut of rhubarb stalk after the fashion of a lantern slide: it will show fairly well, even without the use of a microscope. Avoid the term "nerve" in connection with these things; its use involves a theory of sensation which rests on no proof. The venation of a leaf may be shown very directly in several ways. Soak some leaves in water till the soft parts rot away; then with a camel-hair pencil brush these away so as to leave the firmer vein structure; lay this out to dry and bleach in the sun, and then mount it upon blackened cardboard, or better still, upon a square of glass, 3¼ inches, to be used like a lantern slide. After a wet winter and spring, plenty of leaf-skeletons will be found ready-made lying in gutters and along the foot of hedges and walls; the white poplar is especially useful in yielding such outlines.

Another way of showing venation is by the method of nature-printing. A leaf is laid bottom upmost on a sheet of paper, and a cyclostyle roller is passed gently over it so as to ink the projecting veins. The inked leaf may now be used as a printing-block to give a positive impression upon white paper. Black or blue carbon paper may also be used, the outline and leading veins being well rubbed over it so as to take up a colour-impress. Lastly, in the case of thin, transparent leaves, a photographic print may be made by the Prussian-blue process, the leaf being used as a negative in a printing-frame over a sheet of sensitised blue paper. A very interesting way of showing the vein function is to cut a shoot of some plant with very pale leaves and immerse the cut end in some coloured liquid, such as magenta solution: the red liquid makes its way along the veins, thus revealing them by a kind of natural injection; or the leaf may be purposely injected by forcing the magenta up the stalk by means of a common druggist's syringe attached by a piece of india-rubber tubing.

Before leaving the subject of ribs, observe their arrangement in the leaves of different plants. In many cases there is a single main rib or midrib, and the side ones branch between themselves so as to form a network. In others, such as the horse-chestnut, there are several main ribs which spread out from a common centre like spokes of a wheel, giving the palmate or pedate leaf. Observe in both cases the relation of these ribs to the lobes of the leaf. In another great class of plants, represented by the spring bulbs and the grasses, the leaves are long and narrow, and the veins run in almost parallel lines. Note that this arrangement is almost entirely confined to those plants which are further distinguished as possessing one cotyledon or seed-leaf, which have their flowers in threes, and which are endogens; whereas net-veined leaves are found in those plants which are dicotyledons, which have their flowers in fives or fours, and are exogens, growing in thickness by adding fresh layers on the outside, as seen in the rings of growth in our forest trees.

The shapes of leaves are best illustrated from mounted specimens, all the better if these have been collected by the scholars themselves, in which case the teacher should mark on the mount the donor's name and class, *pour encourager les autres*. The numerous terms used in this connection—ovate, reniform, etc.—may with advantage be left in botanical text-books, since their sole use is as a technical shorthand in describing plants for purposes of identification; common names are much more useful for school purposes—heart-shaped, kidney-shaped, needles, etc. Still less attention may be given to notches and lobes, except to see that these are correctly inserted when drawing leaves, especially with the brush in mass. Young pupils generally err in making the notches in, say, an elm or rose leaf stick out at right angles to the leaf outline, presenting the appearance of a saw-blade or even of a fish-bone. A more important thing in nature-study is to see the cause of some of these variations in shape and surface. Ivy and holly are familiar examples of leaf-change. Some kinds of ivy have at first leaves deeply lobed, so as to be almost star-shaped; the leaves are large, and the lobes long and narrow, and this state of matters continues so long as the plant is climbing. When, however, the ivy gets to the top of the wall, the leaves lose their pointed lobes and also shrink in size, finishing up as smooth, glossy, ovate leaves, which would almost seem to belong to a different plant. So with holly: at the base of the tree the leaves are very crumpled and prickly, as if to ward off intruding cattle; but up at the top, out of reach, the spines gradually disappear, and the leaves assume the ordinary ovate form. Plants which are much exposed to wind and rain will be found to possess finely-divided leaves, as if providing a natural tearing; this gives them increase of strength, since the proportion of ribs to soft tissue is higher than usual, while, in addition, the finely-divided leaf offers less resistance to wind. Any of the umbelliferous plants found in hedgerows will furnish examples of extreme division, and many of these form excellent models for brush-drawing. In the case of water-plants with leaves entirely submerged, the leaves will be found very finely divided. The water-crowfoot is a very interesting plant in this respect, since it has two leaf-forms—an aquatic leaf very finely cut, and an aërial leaf of the usual expanded blade sort.

Before leaving the leaf itself, look at the surface. Most leaves with net-veins are placed on the plant so as to lie in the main horizontally, thus having an upper and a lower surface. Note the difference of tint here, the lower surface being always of a lighter green. This is due to the presence of mouths (stomata), by which excess of water is removed; and an additional cause is found in the firmer texture of the upper surface, which is sometimes quite leathery or waxy, to ward off rain. Observe also the surface defences of a leaf in the form of prickles, hairs, stinging-hairs, as in the common nettle, or waxy bloom, covering the surface with a varnish so smooth as to afford no hold to either rain-drops or insects. Most of these defences are intended to ward off insect intruders, especially ants and others which are of no use for fertilising the flower.

The continuation of this article will deal with leaf arrangement (phyllotaxis), the relations of foliage to water-supply, and the modifications of leaves.

ARTS AND MANUFACTURES.

BY JAMES KNIGHT, M.A., B.SC., F.C.S., F.G.S., F.E.I.S., HEAD-MASTER, ST. JAMES'S SCHOOL, GLASGOW.

PARAFFIN CANDLES.

IN a candle, as distinguished from an oil-lamp, the fuel supplied to the wick is solid, forming the "body" of the candle. Take any candle and light it. At first the wick burns down to near the wax; then some of this is melted, forming a little pool of liquid wax; then this begins to ascend the wick, which from that point acts solely as a burner, and may indeed be made of asbestos or any other non-combustible but porous material. The solid tallow or wax of the candle body is thus first melted into liquid oil or wax; then this is spread out by the wick into a very thin sheet or film, in which condition it is completely vaporised under the heat already present, so that candles are oil-lamps, or even gas-lamps, after all. Show the principle of capillary attraction by various experiments—the action of loaf-sugar on tea, of blotting-paper on ink, of small glass tubes of different calibres on magenta dye, of cotton or woollen threads dipping into any liquid, and so on. Take some sperm or sweet oil in a saucer and try to kindle it by a lighted match; then insert some cotton threads, wetting them with oil to save time; then light these instead of a wick. In thickish oils, such as sperm oil and sweet oil, there must be a large surface of oil exposed to the air in order to effect combustion at the low temperature of a burning match, and this is where the wick comes in. Naphtha and other low-flash oils may be burned as a spray, without any wick; but all candles are made of materials which are not so readily kindled, and therefore need a wick for distribution. It follows, therefore, that the size and shape of

wick must have some relation to the size of candle—a thick candle requires a wick with a large surface.

The first wicks were vertical cylinders, as in the old-fashioned rush-light and in tallow dips. In these latter, the wick is made of cotton, and stands upright when burning, leaving a glowing end which interferes with the luminosity of the flame and causes smoking. Tallow candles thus need snuffers or scissors to remove the burned end of the wick. Should a tallow candle be blown out, the wick continues glowing, and the melted tallow still rises, and is partly converted into acrolein, an irritating vapour with an offensive smell. Light a tallow candle and note its yellow colour, greasy feel, dull light, and smoky flame, and show by experiment the formation of acrolein.

Now take a paraffin or composite candle; observe the difference of colour and surface, also the flat wick and the behaviour of this when the candle burns. The light is whiter, with less smoke, showing that combustion is more perfect; when blown out, the wick dies out at once, and there is no after-smoke or vapour. When burning, the wick needs no snuffers, since it bends over to one side out of the zone of flame, so as not to interfere with the combustion. This is done by weaving one of the threads on that face of the wick shorter and tighter than the others, so that when the thread is burned and the tension relieved, the wick curls over towards that side.

The flat plaited wicks are generally made of flax, a substance which burns away slowly, steadily, and with very little ash. Sometimes even the small amount of ash is removed by medicating the wick. The latter is soaked in borax and ammonium sulphate, and when heated these substances combine with the ash of the wick to form a glass, which may be seen as a fine droplet hanging from the bent wick.

The body of a candle must be a solid substance—combustible, of course—fusible at a fairly low temperature, and capable of burning clearly and easily, with neither smoke nor smell, and without the use of chimneys or other appliances for regulating air-supply. The substances used may be classed as (1) fats and waxes, (2) fatty acids, and (3) hydrocarbons, of which paraffin is the type.

The defects of tallow have been already mentioned. Pure paraffin wax is rarely used, because its melting-point is too low, and the candles are apt to bend over by their own heat, or even at the temperature of a warm room. They are generally hardened by adding stearin. When only a small amount of this is used, the candles are still transparent, like pure paraffin wax; when the proportion of stearin runs up to 10–50 per cent. the candles become increasingly opaque. Pure stearin may be used, giving a hard, white, perfectly opaque candle. Composite candles are those composed of fatty acids, generally stearic acid, obtained as described below. Beeswax and spermaceti are objectionable on the score of expense. Beeswax melts at from 62° to 64° C. (144° to 147° F.). Its natural colour is yellow, and it contains some organic matters not desired for lighting purposes. To purify it, the wax is shredded into fine flakes, washed with hot dilute sulphuric acid (oil of vitriol), to remove this useless organic matter, then bleached until white.

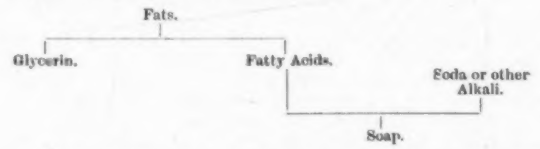
Spermaceti exists in liquid form in the head of the sperm whale, from which it is dipped up in buckets. On standing, this oil precipitates solid spermaceti as a yellow substance, melting at 48° to 49° C. (118° to 120° F.). Like beeswax, it is often bleached white. The chief interest of sperm candles for us is that they form the standard by which gas and other lights are measured for illuminating power. We speak of a certain make of coal-gas as having 25-candle power, of a 16-candle electric incandescent lamp, and so on. The standard candle used in these comparisons is a sperm candle, six to the pound, burning 120 grains of sperm per hour. Sperm is chosen for this because it may be got of constant composition, and it burns at a very uniform rate. Recently pentane candles have been used for standardising, this being the first solid member of the paraffin series, with the chemical formula C_5H_{12}. With a senior class the teacher might explain at this stage the principle of Bunsen's photometer, and the law of inverse squares as applied to illumination.

As to the actual making of a candle, three processes are in vogue. Dips are still made by repeatedly dipping a cotton wick into melted tallow until the desired thickness is attained. This may be imitated in school readily enough. Candles of beeswax are "poured" or "rolled," not moulded, as the great majority of candles are, since wax sticks to the moulds. In this case the melted wax is poured over the wicks held in a vertical frame, and then a proper cylindrical shape is obtained by rolling the candle on a smooth surface.

Most candles are moulded—a process which may also be imitated, at least so far as to show the principle. Grease some brown paper and roll it tightly round a ruler, so as to have the greasy side inwards; then fasten a cotton wick to the bottom of the cartridge thus formed, and pour in melted fat of any kind. When the fat has set quite firm, the paper may be unrolled so as to liberate the rough candle. A tin cylinder does better, but the fastening of the wick is a difficulty; a good way is to attach the wick to a pasteboard bottom and pull it up the tube so as to close this before pouring in the fat. The advantage of a metal tube is twofold: it can be cooled in water, so as to promote rapid solidification; then it may be warmed slightly, so as to permit the extraction of the candle. All these arrangements are provided in a moulding-machine, such as is described in the little pamphlet issued by Price's Candle Company, London. A moulding-machine, then, includes the following features: (1) pewter moulds, (2) jackets for cooling and heating these, (3) clamps to receive the candles when made, (4) box and reels for wick.

The moulds are arranged vertically, with the tip part, designed to form the tip of the candle, at the bottom. This tip piece is separate from the body of the mould, but is connected with a piston rod which pushes up the finished candle into the grasp of the clamps above. When the moulds are empty, the candle-maker heats them by steam or hot water in the jackets till a certain temperature is reached; then the melted wax, heated to nearly the same temperature, is poured into the moulds. This even temperature secures uniformity in the candle body, and prevents anything like crystallisation. Then the steam is turned off and cold water turned on till the candles are cold and quite solid. A knife then cuts the wicks which have been connecting this batch of candles with the previous one still in the clamps; these last are removed, emptied, and replaced; finally, by a lever the piston rods below push up the newly-made candles into the empty clamps, leaving the moulds empty as before. The wick reels are at the bottom of the machine, and the wicks pass up through the piston rods and up the centre of the moulds, being held in a true position by the candles in the clamps.

A few experiments may be made to render concrete some of the technical terms used in candle-making, such as stearin, fatty acids, glycerin, saponification, and the like. Take some castor oil or melted tallow, and shake it up with strong soda solution. The result is a white, creamy emulsion, which on standing rises to the surface and ultimately forms a hard cake of **soap**. To prevent this from dissolving in the liquid, a pinch of salt may be added, for common soap does not dissolve well in salt water. Now examine the test-tube in which this has been done, and a liquid will be found below the cake of soap; this is glycerin, mixed, of course, with any soda that has been added in excess. Any fat or oil similarly treated gives the same result, according to the scheme:—



All fats contain mixtures of fatty acids (stearic, oleic, palmitic) combined with glycerin. When an alkali, like soda, potash, ammonia, lime, is introduced, these fatty acids forsake the glycerin and unite with the alkali, forming soaps and leaving glycerin as a by-product. This is soap-making or saponification.

In common language the term soap is applied only to those compounds (of soda, potash, ammonia) which are soluble in water and therefore useful for washing. A chemist, however, may extend the term to such insoluble soaps as those of lime, iron, magnesia, silica, lead, etc. The "lead plaster" of druggists is just a lead soap; the famous "Carron oil," an emulsion of lime-water and linseed oil, greatly used as a dressing for burns, is simply a lime soap; and so on. All soaps, then, contain one or more fatty acids combined with an alkali, say soda. Take some common yellow or white soap, dissolve it in hot water so as to get a clear solution, then when cold add a few drops of hydrochloric or sulphuric acid: a white solid substance comes down, which is the fatty acid of the soap expelled by a stronger acid. It is these fatty acids which are used in "composite" candles.

Pay of Bull-Fighters and School Teachers.—No less than 490 bull-fights were fought in Spain from March to November 1901. Some 3,000 bulls and more than 5,000 horses were killed in the ring during the year. The chief bull-fighter receives about £80 for each tourney. These expenses, the pay of assistants, etc., make up a total of £480,000, which just equals the total salary list of the Spanish school teachers!

OUR ILLUSTRATED GEOGRAPHICAL NOTEBOOK.

THE PANAMA CANAL.

THAT canals were known to the ancients is proved by the writings of Herodotus, Pliny, and others. Long before the Christian era artificial channels were in existence in Egypt and China, but their chief use was the conveyance of water. In more modern times commercial considerations prompted improvements in this means of communication, and the introduction of canals into our own country in 1758 marks a notable epoch in the history of British commerce. The canal systems of Great Britain are important even in the face of remarkable railway extensions, and would be far more so but for the fact that the railway companies have largely stifled competition by obtaining controlling interests in important links of our inland waterways.

Water Transport.—A very great deal of the world's traffic can never be carried on by road, rail, or canal—the ocean must for ever be the means of communication between vast areas of the land surface of the globe; and in this connection it must be borne in mind that the ocean joins rather than separates continents. Water transport is cheaper than land transport, and the exigencies of modern commerce demand the shortest possible routes along which the vessels of the great trading nations may hurry to and fro.

Ship Canals.—Probably the first canal constructed in Europe was that of Xerxes across the low isthmus of Athos in Turkey, to shorten the passage of ships. But it was the construction of the Suez Canal, by which our route to the East was shortened by over three thousand miles, that opened the eyes of the mercantile world to the incalculable value of ship canals, and it was only natural that engineers should look with longing eyes on the narrow strip of Central America that so effectually separates the Atlantic and Pacific Oceans.

Various Central American Schemes.—That the isthmus be cut through was suggested as early as the sixteenth century; but of the different schemes that have been mooted only one has been seriously attempted. The following are the chief routes that have been advocated at various times:—

1. *Nicaraguan Route.*—It is proposed to connect Greytown on the Atlantic and Brito on the Pacific by means of the San Juan River and Lake Nicaragua—a total distance of 128 miles. The whole of the route has been carefully surveyed, and there is little doubt that sooner or later the waterway will be available to commerce. There do not appear to be any insuperable obstacles, and though Greytown possesses no harbour, that difficulty could be overcome in course of time. An alternative scheme is to continue the canal to Fonseca Bay, which means an addition of 200 miles, necessitating a much longer time than the twenty-eight hours to pass from Greytown to Brito.

2. *Chiriqui-David Scheme.*—Chiriqui Lagoon is an excellent natural harbour, and from thence to David, *viâ* the river of the same name, is well within engineering possibilities; but the fact that there is no available harbour on the Pacific coast militates greatly against the project.

3. *Oliphant Scheme.*—From the Gulf of San Blas to Chepo is only 30 miles, and is the narrowest part of the isthmus. The shortness of the route is unfortunately its only recommendation; the situation is bad, and the natural difficulties are very considerable.

4. *Caledonian Bay Scheme.*—It is suggested that the canal pass from Caledonian Bay to the Gulf of San Miguel by means of the Tugra River. This was the scene of the Scottish expedition under Sir William Paterson in 1699. The Darien Scheme turned out a dismal failure, and entailed the loss of about forty millions sterling. Various unpromising features of this route led to the idea that the canal might start from Chipigana with far better prospects of success.

5. *The Tehuantepec Scheme.*—Though not within the scope of the accompanying map, mention of this scheme must not be omitted. Cortez, the Spanish adventurer and pioneer, obtained grants of land with the idea of carrying out a grand canal project across the southern portion of Mexico. More than half a century ago the suggested route was surveyed by experienced engineers, who reported very favourably. The route would be 140 miles in length, and would pass through a break in the mountains which allows of an easy junction with the Coazacoalas River, which is deep enough for sea-going vessels. From the view of the United States and Canada, this scheme, if carried out, would be eminently desirable. Liverpool and Yokohama would be brought within 11,000 miles of each other, which at present is only practicable by means of the Canadian Pacific Railway. From Liverpool to San Francisco would become a journey of less than 7,500 miles, which is less than half the distance now traversed *viâ* Cape Horn or by way of Suez.

All these schemes, however, are practically unimportant compared with the

Panama Canal,

the construction of which was commenced a little over twenty years ago. It was the outcome of an international congress convened by Ferdinand de Lesseps in 1879. The result was the formation of the Panama Canal Company, which got to work in 1881. The progress of the scheme was simply one long story of carelessness, inaccuracy, and shameful corruption. The "preliminary expenses" amounted to nearly £2,000,000 before a spade was bought. The surveys had been carried out in a very perfunctory manner, the specifications were vague and untrustworthy, the leakages on contracts were enormous, and by New-Year's Day 1889, when the company went into liquidation, £70,000,000 had been expended in completing about one-fifth of the work. The failure shook France to her very foundations. The scheme was not dead, notwithstanding; for a new company rose upon the ruins of the old, and the Colombian Government renewed the concessions several times. But French faith was not strong enough to finance it further, and the scheme languished until the United States seriously considered the advisability of undertaking the completion of the work. Negotiations were commenced for the transference of the canal; but for years it seemed as though no terms of agreement would ever be reached, and in the meantime the Nicaraguan route was more seriously considered. Eventually a treaty concerning the Panama works was signed, on April 23rd last, by representatives of the United States and Colombia.

The treaty provides for the perpetual leases of a strip of land for the canal route six miles wide. The terminal cities of Panama and Colon and the adjacent islands are brought under the control of the United States. It grants the Panama Canal Company the right to dispose of its entire rights, title, and interest to the United States, the lease to run in hundred year periods. The company assessed the value of its works at £8,000,000; but the price to be paid remains unfixed, and failing an agreement between the contracting countries may be decided by a commission, or may be referred to the Hague tribunal. There is now no reasonable doubt that the Panama Canal will become an accomplished fact.

The experiences of the past show that the original plan of a canal at sea-level is at present quite impracticable. The river Chagres is subject to heavy floods, to avoid which the construction of an immense lake or reservoir is necessary. This lake will not only mitigate the floods, but will supply the canal with water during the dry seasons, and will assist in the working of the locks, of which there will be at least four.

When the operations commenced in 1881, the pestilential vapours carried off the workmen in thousands, causing an immense increase in the estimated cost of labour. So bad were the local conditions, and so inhuman the manner in which the old company dealt with its employees, that a law was enacted forbidding the transport of Jamaican blacks to Panama. It is stated that the climate is now much more favourable, and the law having been abrogated, there are several thousands of the natives of Jamaica at work for the new company.

When the Panama Canal will be completed it is still impossible to say—probably from six to nine years. The treaty has certainly been signed by Señor Concha, the Co-

lombian minister, but the temper of South American republics is notoriously uncertain. The Colombians may not altogether favour the entry of "Uncle Sam" into their territory, in which case opposition may not improbably take the form of a revolution, and revolutions occur in these regions with far less occasion. On the other hand, the completion of the canal, whether by the United States or by a private company, will mean an enormous increase in the transit trade of the country, which at present passes along the Panama railway.

The following description of this railway by a well-known journalist may be quoted without comment:—

"The railway, being an absolute and impregnable monopoly, may perhaps be excused for being the very worst on earth. The distance is 46 miles, and the 'reduced' fare for first-class passengers holding through tickets to the Pacific ports is £2. If you haven't a through ticket, the fare seems to be just anything that the officials like to charge you. At any rate, a fellow-traveller of mine, who was only booked to Colon, had to pay twenty-five shillings for himself and a sovereign for a small portmanteau, and then had to ride like the rest of us, who had paid first-class fare, in a second-class carriage, well filled with negroes, Chinamen, and, still more objectionable, Colombians, at the rear end of a baggage train, which took nearly five hours to crawl over the 46 miles of level track."

Ship canals are costly undertakings. Our own Manchester Ship Canal cost £16,000,000, and has not yet earned any dividends. The Suez Canal cost £20,000,000, and in 1899 the net profits amounted to over £2,000,000. In 1876 the British Government purchased the Khedive's shares for four millions; to-day they are worth six times as much, and their value is increasing. The completion of the Panama Canal will revolutionise some of the world's main shipping routes, and there is every reason to believe it will prove a huge financial success.

THE INSPECTOR'S NOTEBOOK.

BY AN INSPECTOR OF SCHOOLS.

Officials are Strictly Neutral. Officials must, of necessity, observe strict neutrality in times of political tempests such as the present. There is something paradoxical in this situation. The opinions of the inspectors upon the Education Bill would be interesting, if not useful, to the public. I may be wrong, but it seems to me that an inspector is most advantageously placed for viewing impartially the gladiatorial combats. We have had the views of the teachers, of the clerics, of the anti-clerics, and of the political hucksters. What does the inspector think?

The Inspector's Vantage-Ground. He is primarily concerned in the betterment of education, and his daily vocation will naturally incline him to discount the rash opinions of the extremists of both sides. The drum ecclesiastic allures him not. He knows well enough that the religious difficulty is a political myth. The fanatics who are making political capital out of the crisis make no impression on the expert. Probably there may be some difference of opinion as to the value of the Bill to fulfil the purposes for which it is intended, but most of the officials will judge the Bill simply as to whether or not it makes for the betterment of education generally.

Unification Badly Wanted. I fancy all agree that some reform is urgently needed, and most will be glad to see one authority constituted to deal with all kinds of education. Whatever happens, it appears to me the dawn of the educational millennium is at last close at hand. May all of us who desire educational progress be ready to take advantage of its advent!

"A Diller, a Doller, ten o'clock Scholar." How may we best deal with our late children? This is a problem which I have had to give advice upon several times lately. Punctuality needs no briefing. Let us then consider the remedies for unpunctuality. I don't agree with corporal punishment except for exceptional cases. Let a record of the late children be kept. The head-master should inquire daily of the scholars as to the causes of their being late. After registering the delinquents for some time, he will be able to discover who are the regularly late children, and it would be advisable then to interview the parents of these. Should it appear that the fault lies entirely with the child, in any case some severer form of punishment than scolding might be administered. My observation leads me to believe that the punctuality or unpunctuality depends very much upon the individual teacher. I know of schools of three or four hundred children where for a whole week only ten or less will be late. I could tell of other schools of eighty where you will always find twenty-five per cent. late.

There is a certain amount of laxity allowed by some teachers. I have been told that in some schools the children are not thought late who attend within fifteen minutes of the opening. Now, that policy seems fatal to me. I would have every child absent at prayers considered late unless a valid excuse were forthcoming.

Periodical Examinations. The head-teacher's periodical examination is frequently capable of improvement. In the first place, there should not be more than three or four examinations in the year. Generally the three elementary subjects are tested, but not so often do I find that the rest of the curriculum has been reviewed. I find frequently no expression of opinion upon geography, history, etc., for the whole year, whilst reading, perhaps, has been examined monthly. This tends to give too much importance to the old drudgery of the three R's, and handicaps the intelligent portion of the syllabus. I advise head-teachers to partially judge the work of their assistants after the style of inspectors—namely, by watching how the lessons are given, and by perusing the prepared notes of the lessons. In the top standards I would have three examinations per annum, and I would let the questions in most of the subjects be answered on paper. In the lowest standards I should conduct practically the whole of the examination orally. Why should not children in Standards VI. and VII. be able to write on paper a connected and fairly long answer to a history question? The more one can get at the individual the better. In addition, I should take each scholar of the first class individually, and subject him to a short *viva voce* test. This latter would, in my case, be intended more for the purpose of becoming acquainted with the individual traits and capabilities of each scholar.

The Annual Entertainment. Every school should, in my opinion, have its annual speech day, but I am not one who favours very elaborate performances on such occasions. It is absurd, I think, to train a few of the best scholars to perform some marvellous feat. Let us have a modest programme, so arranged as to allow of a large proportion of the scholars to take part, and so as to give the parents an idea of what their children learn at school. In a word, put on the stage a few of the ordinary lessons, and let each class do something. The great thing, it seems to me, is to gain the good will and sympathy of the parents, without which no school can succeed. I would invite parents to visit the school on some day during the teaching hours.

The "Notebook" Query Column.

E.A.S. wants to know where to get reprints of the questions set at the Physiology (Advanced) Science and Art Examination. She would like model answers thereto. Can any reader help in this matter?

E.T. is an ex-pupil teacher in a Scotch school. She passed the first year certificate examination in 1895 (Scotland), and wants to know whether or not she is eligible to sit for the English Certificate Examination, 1903. If so, will it be necessary for her to enter an English school before taking the examination?

Answer—I know of no regulation which would debar her from taking this examination. I don't think she would need to enter an English school previously, but I advise her to make quite certain by writing to the Board of Education.

V. V.—To obtain certificates in drawing you should join a class in art. You cannot cram up music privately to obtain a tonic sol-fa certificate. As you are sitting at the next King's Scholarship Examination, my advice to you is not to give too much time to those subjects, especially if you are seeking entrance to a training college.

A.L. is a trained certificated mistress at present teaching in a secondary school. She desires advice as to how she may increase her qualifications.

Answer—Either she should qualify for the L.L.A. degree of St. Andrews, or, if she feels able, she should enter for the B.A. or B.Sc. (London). The L.L.A. is a far less exacting task, and probably would cover all that she needs. She should write to the Registrar, The University, St. Andrews, for a syllabus of the examination. I should advise her to receive coaching either privately or by post. If she is very clever, strong physically, and has a fair amount of leisure, I should say try the London B.A.; but perhaps it would be best to get the L.L.A. first.

NOTES AND JOTTINGS.

The Modern Language Press, whose works we have frequently noticed, has removed from Fleet Street to 13 Paternoster Row, E.C.

Our next number will contain an article on freearm drawing for infants by Mr. J. Vaughan, which will be illustrated by a large sheet supplement.

We very much regret the omission from the list given last month of the Holiday Course in French conducted by Professor L. Bascan at Villerville-sur-Mer, near Trouville. This course is given under the patronage of the "Alliance Française," and we have no doubt that it will prove as useful and enjoyable this year as in the past. The course runs from August 5 to 26; the fee is £2, 5s., including the examinations; pension, 5 francs; subjects include phonetics, conversation, composition, reading, translation, and French methods of teaching. Further particulars may be obtained from Professor C. Bascan, 49 Rue Caponière, Caen.

We have received from Messrs. Marlborough and Co. a copy of their handbook entitled *Hindustani Self-taught*. As the gentleman who does the Hindustani for us is "out to lunch," we cannot give a critical review; but apparently, if any of our readers are in want of a handbook giving phonetic pronunciation, vocabularies, conversations, and idiomatic phrases in Hindustani, they will find here a book that will suit them.

We are very pleased to inform our readers that the Board of Education has received, through the Foreign Office, an intimation that the Council of the University of Paris has decided to publish annually henceforth, in the month of April, a programme of the university lectures which will be delivered in the academic year beginning in the following November. This plan has been adopted in order to enable foreign students, who may desire to attend the lectures, to make their arrangements conveniently in advance. The programme of courses for the academic year 1902–3 can be seen at the Board of Education Library, St. Stephen's House, Cannon Row, Whitehall, S.W.

A strongly-supported petition has been presented to the Council of the Senate of the University of Cambridge asking for the appointment of a special sub-committee to inquire into and report upon the best means for enlarging the opportunities for the study of economics and allied branches of political science. The fact that different views on this subject are held by different students of it does not prove it to be an unimportant one, but rather shows the need for encouraging research into those facts upon which the opinions are based, and we earnestly hope that Cambridge will be able to do something in the matter.

The appointment of Mr. H. W. Orange as Director-General of Education in India has called forth some strong expressions of opinion in the Indian press. *The Pioneer* very pertinently writes regarding the appointment:—

"It is absurd to say that there is nobody connected with educational work in India who is as well fitted to take charge of the new office as a young man whose experience is confined to Whitehall. But if there is such a person in India, then the Government ought not to have gone farther afield. To do so is not only to deprive the Indian public of any sort of assurance on which they can estimate that the new official knows anything about the work he will be called upon to do, but also to damp the zeal of the men who have perhaps spent the best part of their lives in educational work in this country."

We venture to add that the "zeal of the men who have perhaps spent the best part of their lives in educational work" in countries nearer home is considerably damped by finding that public service is not the path by which the higher educational appointments are attained.

A COURSE OF OBJECT LESSONS FOR GIRLS' SCHOOLS.

BY WILLIAM DONE, B.A.,
Head-Master of Brighton Pupil Teachers' School.

XXIV. SYRINGE.

Articles of Illustration.—Glass syringe; common squirt or garden squirt; bowl of coloured water; piece of soft glass tubing.

Experiment and Observation.	Result or Inference.
1. Take a straight piece of glass tubing; place one end in a glass of coloured water; suck the air out at the other end. When the water reaches nearly to the top, place the thumb tightly over that end.	The girls will perhaps say that the water has been sucked up the tube. Let this reply pass for a moment. The reason for the water remaining in the tube will be known from the previous lesson on the barometer.
2. By raising the thumb slightly for an instant, a little of the water may be allowed to fall out.	For an instant the pressure of the air inside and outside the tube was the same, and the contained water commenced to fall, being unsupported. The pressure of the air above was suddenly taken off, and so the rest of the water remained in the tube.
3. The tube being now about half full of water, place the thumb tightly over the lower end, and holding the tube vertically, ask a girl to suck the water up the tube.	The water does not rise. Evidently the inference in experiment number one was wrong. The water was not drawn up the tube.
4. Repeat experiment number one.	The air is sucked out, and the water follows up the tube, being raised by the pressure of the outside air on the water in the bowl.
5. Refer to previous lesson on the barometer, and ask what kept the mercury in the tube.	The pressure of the air on the mercury in the bowl supported a length of mercury in the tube about 30 inches, and as mercury is much heavier than water, the pressure of the atmosphere would support a much longer column of water.
6. Take the glass syringe to pieces; let the girls name the parts as far as they are able.	The parts of a syringe, which is also called a squirt, are— (*a*) Barrel. (*b*) Piston and rod. (*c*) Nozzle.
7. Show a garden squirt, a toy squirt.	These are also forms of the syringe; but a glass one is best for our lesson, as we can see through it.
8. Insert the nozzle of the syringe in the coloured water, and pull the piston slowly upwards.	The water follows the piston up the nozzle into the barrel.
9. Repeat the first experiment of the lesson, and compare with this last one.	In one case we sucked the air out of the tube, and the water followed; in the other case we lifted the air out by means of the piston, and the water followed.
10. Lower the piston-rod sharply, thus emptying the syringe.	The water spurts out, owing to the pressure behind it.

XXV. COMMON PUMP.

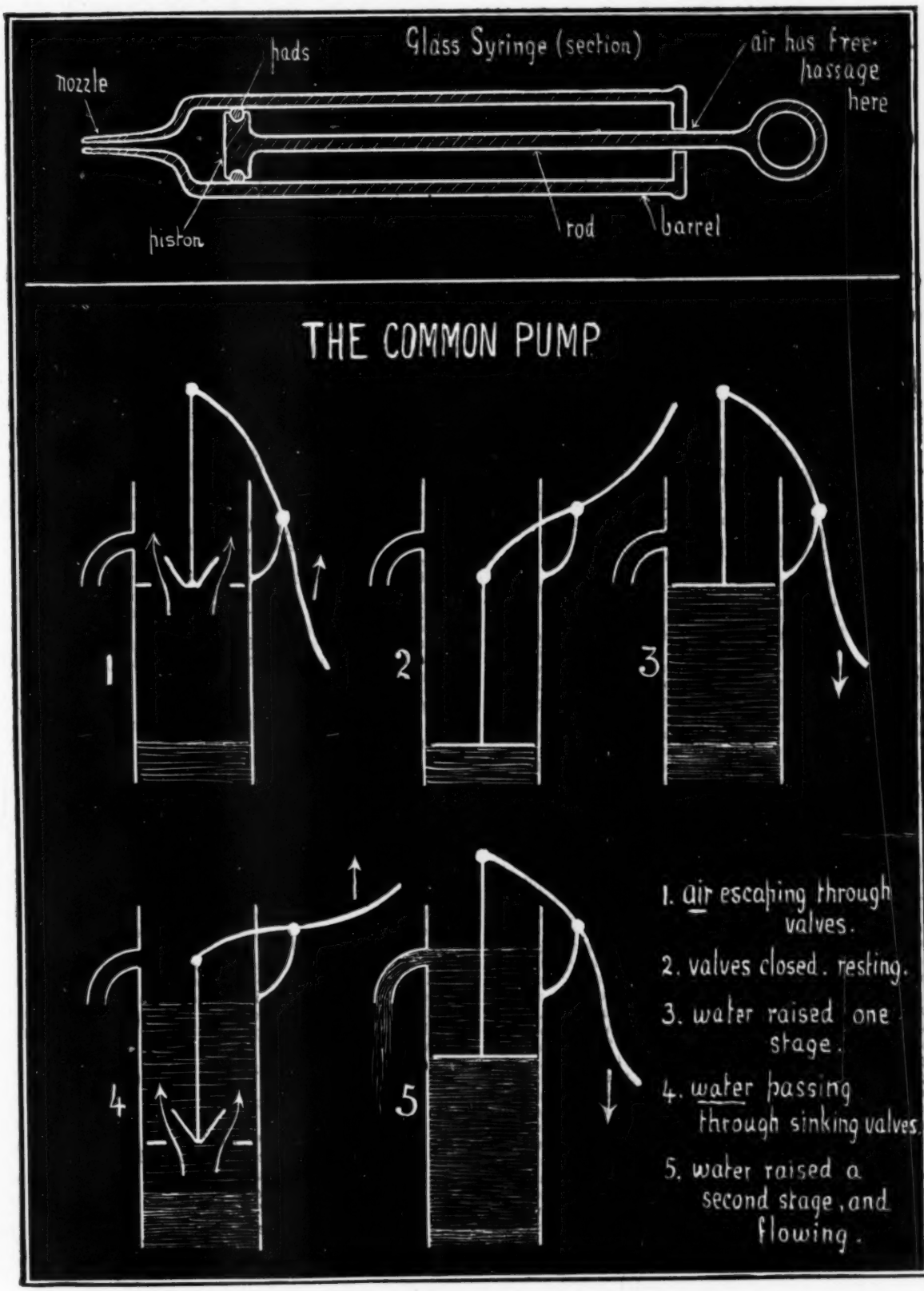
Articles of Illustration.—Blackboard sketches, as shown with this lesson. A model glass pump, such as can be bought from Messrs. Philip Harris and Co., Birmingham, for 2s. 9d., is a useful piece of school apparatus. A soda-water or lemonade bottle, with a glass marble inside as stopper, is convenient to illustrate a valve; also the air-box of a squeaking toy, especially one with a hinge valve; a pair of bellows is especially good, but perhaps not so easy to procure.

Experiment and Observation.	Result or Inference.
1. Take the empty glass bottle as above; pour a little water in it. Reverse the bottle so that the marble falls into its proper position.	The marble presses against the narrowing neck of the bottle, and will not let the water pass that way.
2. Compress and release the air-box of the squeaking toy, or work a pair of bellows in such a position that the girls can see what goes on. Confirm the explanation of the action of the valve by attempting to use the bellows with the valve on the upper side.	In the case of the toy, when the spring of the air-box is released, the air forces its way into the box through the little opening at the bottom, pushing up the flap; but on squeezing the box the flap falls down, and the air can only pass out some other way, such as across the reed which makes the squeaking sound. In the case of the bellows, the flap over the hole is very plainly seen opening and shutting like a door on hinges.
3. Cut open the air-box of the toy, in order to see the flap more plainly. Give name *valve*.	Valves may have different shapes, but their use is the same—to allow air or something else to pass only one way.
4. Take the model glass pump, or refer to the blackboard sketch, and point out the parts.	A pump is made somewhat similarly to a syringe. It consists of— (*a*) A long pipe which dips into water like the nozzle of the syringe (suction-pipe). (*b*) A barrel. (*c*) A piston and rod.
5. Get the girls to observe the mechanism of the pump more closely, and find out how it differs from a syringe.	At the bottom of the barrel there is a hinge valve which opens upwards, and when closed completely covers the top of the suction-pipe. In the piston itself there is also a valve, or perhaps there are two valves, which also open upwards. We notice that the piston-rod is raised or lowered by means of a pump-handle. Lastly, there is a spout high up the barrel.
6. Question out what effect the raising of the piston will have on the barrel and the suction-pipe. Demonstrate also with the model.	As in the case of the syringe, raising the piston will draw the air away from the barrel, and eventually from the suction-pipe. The water will follow up and enter the barrel. When we stop raising the piston, the valve over the suction pipe will fall, and the water will remain in the barrel.
7. Trace the further effect of lowering the piston.	When the piston is lowered, though the water cannot be forced down the suction-pipe, it can pass through the valve in the piston, and so get into the upper part of the barrel. Again, when the piston ceases to descend, the valve falls, and prevents the water pas-ing below it.
8. Show what will happen to the water above the piston when the piston is raised again.	The water above the piston is actually lifted further up the barrel, and falls out at the spout.
9. Work the pump.	By combining these actions we obtain a steady flow of water.

THE report of the Charity Commissioners for 1901 shows that at the end of the year there were no fewer than 23,103 charities on their register. It mentions that a part of the work of the Commissioners has been taken over by the Board of Education, and contains an outline scheme for superannuation of both head and assistant teachers in endowed schools.

BLACKBOARD ILLUSTRATION.

BY C. ARMSTRONG, ART MASTER AND SOUTH KENSINGTON EXAMINER; PRINCIPAL OF ARMSTRONG'S DRAWING SCHOOL.



The Practical Infant-School Teacher.

OUR MODEL INFANTS' SCHOOLS.

VIII.—HILL SCHOOL, SUTTON COLDFIELD.

Head-Mistress—MRS. A. BROWN.

EXCELLENT as are many of the large schools in populous towns, it must not be concluded that these are the only centres where useful hints as to methods of teaching and organisation can be obtained. It is a good thing for the village child that some of the most worthy of our teachers find their way, either from choice or from force of circumstances, into the so-called "rural schools."

Not so very far from the noise and bustle of a large and smoky manufacturing city in the Midlands stands an ideal little school, the prettiness and the management of which would be hard to surpass.

It is known as the Hill School, and the postal town is Sutton Coldfield.

It is an ideal school from several points of view. Its situation is in a health-giving spot with an immense stretch of open scenery, consisting of copse and knoll and upland meadows, dotted here and there with newly-erected residences of those who have amassed wealth in the city, and near by, less than five minutes' walk, a common which is the pride of the city and the neighbouring towns. Here are found immense lakes and woods, beautiful winding paths, stretches of gorse and heather which are the rapturous delight of sportsmen, boys, wild birds, and animals of every sort.

The school is managed in a delightful way. The trustees are sympathetic, the committee shows abundant evidence of progress in matters educational, the mistress and teachers are kind and well-informed, and not the least factor in the happiness of all is the fact that in every way the parents are in cordial friendship with the school and its work. The children are clean, and their manners delightfully charming. They come from miles around, and trudge along through the storms of inclement days with almost the same regularity as they loiter amid the delights of a balmy air in summer time. They are big and well grown for their age, their faces are radiant, and their minds clear of those devices which tend not always for good in the boys and girls of smoky, crowded towns. They are quiet and manageable, and not so very backward with those that are strangers to them.

The number all told is ninety and nine, and the number present during this morning's school is seventy-three. They are taught in three divisions, under the care of the mistress, an assistant-mistress, and a monitress. The reader will gather at once that the classes are small, and that under good management the children will get a large share of individual teaching. This is exactly the case. The mistress takes her full part in the teaching; and as the assistant-mistress has been in the school a considerable time—ever since she was a girl of fifteen, in fact—she has grown into the ways of her chief, and has become a real and valuable help. The monitress, too, is fully devoted to the interests of the school. She is the pianist, the caretaker of the valuables of the school—such as the specimens in the museum, the newspaper records of concerts, and school reports, and all the things that go to add to the name and fame of the school. She is an eminently useful adjunct to the staff.

The school itself is detached from the boys' and girls' departments, and forms a building all by itself. As you walk from the road along the short, gravelled path and come to the porch, you can tell at once that it is an infants' school. On the right is a neatly-kept cloakroom with low pegs, on which are hanging tiny garments. Encircling the doors inside the porch are curtains of stringed reeds, which give a delightful touch of beauty to the place. On the left is the schoolroom door. All is quiet within. A gentle tap, and the door is opened; and as you enter, the thought of cosiness rises uppermost in your mind. The school consists of one room rather long for its width, with a gallery at one end for collective lessons. It is remarkably well lighted. The panes at the edges of the windows are tinted green, the lower ones being frosted white, with designs in colour (brushwork) sketched thereon. The effect is very pretty. The walls are light in colour, and are literally covered with well-arranged pictures and cases for use in object teaching. The fires in two fireplaces add to the charm of the school, and give it a home-like appearance. Of apparatus there is plenty; a piano and a well-filled museum are conspicuous pieces of the furniture.

The hymn, prayers, and Scripture lessons are over, and the registers are on the point of being put away. You are just in time to see the actual school work.

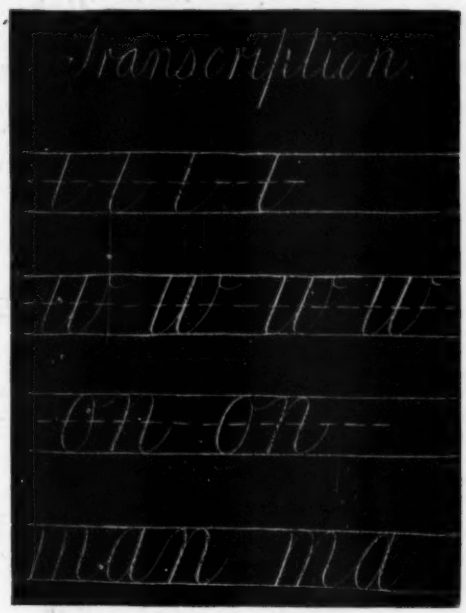
As may be seen from the time-table, the first exercise of the day consists of singing and marching. The singing is done chiefly from the modulator and from hand-signs, and the marching is to music.

Transcription.

The younger children settle themselves for writing. In this group there are four divisions, although the total number in the group is only twenty-seven. The blackboard, a copy of which is shown in one of the illustrations, shows the combination of the teaching. The babies, five in number, write the first line in sand with the finger, the other rows each their copy as seen on the blackboard. The monitress gives splendid blackboard instruction and equally splendid supervision. It was quite amusing to see her, when she wanted a fresh slateful of writing, moisten the slates with a wet sponge tied to the end of a pointer, while at a command the sand writers shook the sand and obliterated all traces of previous work. You have to be quick, and no mistake, with twenty-seven children in four divisions. The complete scheme of transcription for the lower division is as follows:—

i i i n u m
o a d c
in ni min un
an on no
man am can mad
en men came va vane wine
ri rim sir two
lad let do done
him hat bat bun pan
nip quit queen jam jet
gem got yes eye oft kin ink
zeal zone.

The scheme contains all letters and combinations of letters, except *x*. The middle division did some quiet work of their



own, while the upper took a reading lesson with the assistant-mistress.

Reading.

It must here be said that the teaching is altogether and entirely up-to-date. First of all, a story is told of a little boy who, against parental instructions, climbed a tree in search of a bird's nest, fell down and hurt himself, and learnt the consequences of disobedience. Then the words used in the story-telling were printed on the blackboard, sounded on the "look-and-say" method, and repeated. Then books were opened, and the same story was read by the teacher, followed by the children, not in turns, as is generally the case, not even on the teacher's calling for readers by name, but by volunteers who wished to read. In this particular instance volunteers were numerous, and were the rushes for military volunteers as plentiful, there would be no talk of conscription in England for many years to come. The few who did *not* volunteer to read did not escape. The teacher adopted the "press-gang" method, and compelled them to the task; but there was little need for her doing so. When all had had a turn, more blackboard work was resorted to, and some really clever work was done. There is no standard class in the school. This group consisted of six-year-olds, and the following words were worked out—*bat-ter, fat-ter, hat-ter, lat-ter, pat-ter, rat-ter;* then repeated together, and sounded by individual children when called upon either by name or in turn. Brightness and briskness characterised the blackboard work, and the children did *all* save the actual writing of the words. The "look-and-say" method is in great favour with the mistress. Some years ago, before trying it, she heard of remarkably successful reading from her friends in various parts of the country, and essayed it. She was rather disheartened at first, for it does seem hard to the children at the beginning; but by dint of perseverance and persistency, so great was the success she achieved, especially when until recently she had a standard class, that she would not now depart from it for worlds. To show what a six-year-old can do in sight-reading, when taught on the "look-and-say" method, a prize book was procured from a cupboard, and one or two children read some previously unseen passages. This was one of the sentences, and it was managed quite accurately, and without the slightest hesitation: "The only place where Mary might not go was the flower garden, etc." And other words on the same page, also managed well, were: *couldn't, terribly, angrily, happened,* and *kitchen.* To crown the whole, the writer of this interview wrote on the board, not in that kind of writing which is famous for its clearness and boldness, but in ordinary script, the word *irresponsibility.* For a moment or two it looked as though it were beyond their little powers; but after a good look and one or two near attempts, it was pronounced with perfect accuracy. This was a thorough test for the children, and went still further to convince the mistress of the efficacy of her plan of teaching. The writer, who has seen a large number of infants' schools, and is fortunate in having the same system in practice in his own junior department and the infants' school attached, is a strong advocate for it, and cordially recommends it. It *does* want patience and persistency at first, but by-and-by all goes merrily as a marriage bell.

Playtime.

It was charming to see how smartly all work was stopped at the click of the "code-signal" for playtime, and equally charming to watch the effect of a kind and firm discipline. The children stood, and turned gracefully and with precision; and further than this, did not wobble about and trifle with hands, hair, pinafores, and other things which are often in the way of little children, and prevent them from executing an order in the best style. After a moment's pause, during which the silence could almost be felt, a chord was struck on the piano as a signal to "get ready," and then a tune was played in double march time. The children *ran* to their play at the double, and well they did it too. Their bodies were held in a correct position, with hands on hips, and the step was light and buoyant, and in perfect time with the music. After a few minutes' play, during which the children ate their lunch and amused themselves each in their own way, the children were brought together in lines, and a playground drill was performed. Two divisions were arranged. One of them worked entirely in rings at one end of the yard, after the manner of "follow-the-leader," and the other went through a series of figure-marching. The playground drill was very striking; and although the wind was high, the little ones worked with a right good will, and rarely made a mistake. They enjoyed it immensely, and were in good form.

Singing.

On reassembling, a singing lesson was taken. This consisted entirely of songs. The mistress has wisely made this part of the work of the school very attractive. Of songs she has a remarkably good selection. From very easy pieces, suitable for the babies and the lower division, the songs range to those which are popular at home and in society. There is a huge pile of music on the piano, and piece after piece was rendered with perfect intonation and correct production of voice. There were none (or few) of those gross chest notes which are raucous and distressing to listen to. The notes were produced in the head with arched mouths, and were round in quality and tone. This is the result of careful training on sound principles, and great attention to individual voices, and much of it can be put down to the morning exercises on the modulator. Perhaps the most enjoyable song of all was "The Tennessee Christ'nin'," which Miss Amy Height made so popular a few years ago in pantomime. The humour of the song was appreciated, and the smiles, the actions, and the loudness and softness with which some of the phrases were emphasised were most delightfully executed. This kind of song serves at least two purposes: it gives scope for variety—and really good infants' songs are hard to obtain, though many of a sort are published—and it is useful in the home. In a country district such as this a coon song is a treasure. The father and elder brothers enjoy it immensely, and listen to a repetition of it over and over again; while as to the actions that illustrate the singing, they simply go wild with delight over them. Another pretty song, and one which lends itself to action, was "The Invalid Doll," which can be found in *Action Songs,* published by Williams of Berners Street. The mistress and teachers are constantly on the search for songs, and their verdict is, "They are found best in school magazines and in two-shilling copies."

Recitation.

The singing lesson had lasted longer than was expected; or, to put it the other way about, the time had gone so

BRUSHWORK—LEAF FORMS.

quickly that the lesson was over before the nearness to twelve o'clock was noticed. There was just time for a few recitations. Volunteers were asked for—this is a splendid way of inculcating a ready response to teachers' wishes when it is properly worked—and were quickly obtained. Those who were selected came to the front, stood on a chair with a duster laid neatly on the seat, and performed with utter oblivion of self and everything. There were some very humorous ones in the repertoire, and the fun was keenly appreciated, though the children who listened must have heard them many times.

Dinner Time.

And now it was really time to go. The children were brought up to marching order again, and after singing grace, "Be present at our table, Lord," went out of school at the double; but as some of them approached the door they turned on their own account, and seated themselves on the gallery. These were the "dinner children." The teachers, too, were staying; and during the dinner hour the same sympathetic relation was seen between teacher and taught as was evident in school time.

Afternoon School.

The afternoon was devoted to the task of showing that village schools in good circumstances are *not* behind those in large centres of population. Let the writer say at the outset that he has always believed this to be the case. He has known schools in the country which, for excellence of work and thoroughness of method, could not be surpassed or even reached by larger schools. Given an enthusiastic teacher with a small school, and large ones must take second place.

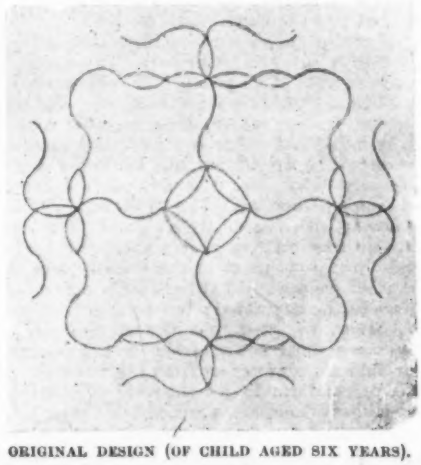
Before a commencement of the work of the afternoon is made, a point with regard to the drill must be cleared up. During the morning the writer had noticed a large number of dumb-bells piled up in a heap in a corner of the school, and without asking for information, he had come to the conclusion that as the boys and girls of the same school were so closely allied in friendship with the infants, the dumb-bells must be theirs, and that they were in the infants' department for a special reason. This was a conclusion which ought not to have been arrived at. The little children really use them; and what is more, there is in a basket of some considerable size a number of Indian clubs which are used by the upper division in physical exercises. They are very light, and are exceedingly pretty in form. It would have been nice to see some exercises with these, but time for doing so did not suffice. At any rate, the fact of their being there indicates how very advanced and up-to-date the school is in its aims and achievements.

Varied Occupations.

The early part of the afternoon was devoted to the all-engrossing varied occupations. The upper division essayed a pattern in brushwork. During the latter part of the dinner-time, the monitors who happened to be "dinner children" had arranged the materials, consisting of water dishes, brushes, and drawing-books (the "A.L." series ruled in inch squares), on the desks ready for use. The mistress rapidly passed round the class and served a squeeze of colour from a tube, and the children themselves mixed it to the required consistency. They quite understood what they were doing, for in every case in which the writer tested the colour so mixed he found it perfectly workable. Then, when the children were ready, a large sheet of drawing-paper on which there were the forms taught at the last lesson was pinned on the blackboard, a new form drawn with colour and brush underneath, and a few instructions as to shape and position of leaves were given, and the children set to work. It was most noticeable how they gauged the space of the paper and the forms they were required to do. There was clear evidence of the value of this style of work; neatness, care, and accuracy were most conspicuous. It was quick work too, and the mistress could but just keep up a close supervision of the whole. The books of the children showed a systematic course of work: first there came the inevitable "blob" in vertical, horizontal, and oblique positions, then straight lines and curves, and then combinations of these; after that there were double and treble "blobs"—the whole showing a splendidly-conceived scheme.

While writing on this form of "varied occupations," mention must be made of the freehand drawing course. The children again work on squared paper. The five-year-olds are confined to the straight-lined copy with a little attempt at design, with the opportunity towards the end of the year of trying a simple curve or two. The six-year-olds do design work in blacklead and crayons, copy pictures from the reading-books, and sketch original illustrations of object lessons when they are within their reach. The duck shown as a specimen of work is an example of this. Next year, if all goes well, freearm drawing will be attempted. The task seems a formidable one; but, as in former cases when an introduction of new work has been made, the difficulties have simply cropped up to be overcome. The will is there, and the way will be sure to be found.

While all this was going on with the upper division, the middle was engaged with tablets, and some very pretty work was executed. A new feature in this class of work was introduced as a means of laying the foundation for future



ORIGINAL DESIGN (OF CHILD AGED SIX YEARS).

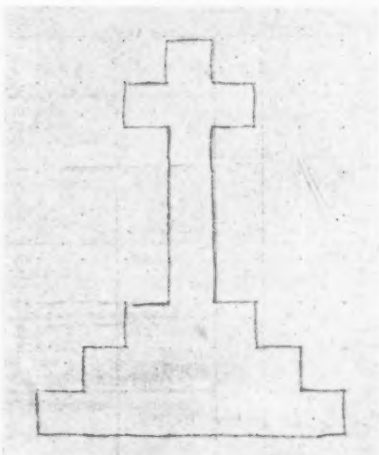
memory drawing. During the first stage of the lesson the tablets were placed on the desk, with the aid of a coloured drawing on the blackboard. Then, when the pattern was

completed, and examined for a time, the blackboard was turned round, the tablets put back into the boxes, and at the command "Go," the design was reproduced from memory, and afterwards compared with the pattern on the blackboard. This was a combination of colour work as well as the formation of a pattern, and it appeared to be a very useful, though, for little children, a trying exercise. The junior division had a lesson in colours, using boxes of coloured balls for the purpose. Some pretty rhymes were repeated collectively during the lesson, all dealing with either the colour of the ball or the position in which it was placed. The swinging of the balls to the singing of a song was a very effective exercise.

While these lessons were in progress, an opportunity of looking over some past work done in the "varied occupations" lessons was afforded. At the fireplaces there were two Smyrna rugs which the children had woven, and in the museum were baskets and napkin-rings made of beads, and table-mats made of straw. These are all useful articles. The table-mats were very ingeniously made. First a piece of cardboard is cut to the required size; then straw is woven on both sides of the cardboard, the straw being of various colours; and a border of straw is stitched all round the edges to make the whole secure. It was through seeing these mats in the house of a friend in a neighbouring town that the writer of this interview was induced to request permission to visit the school; for he felt sure that where such good and effective and useful work as this was being done, there would be in a general way more excellent species of work. The mistress has had a set in constant use for six years; it washes well, and stands the wear and tear remarkably well. She has kindly offered to supply, through the editor of THE PRACTICAL TEACHER, the name and address of the firm that supplies her with the straw. As a "varied occupation" it is highly recommended.

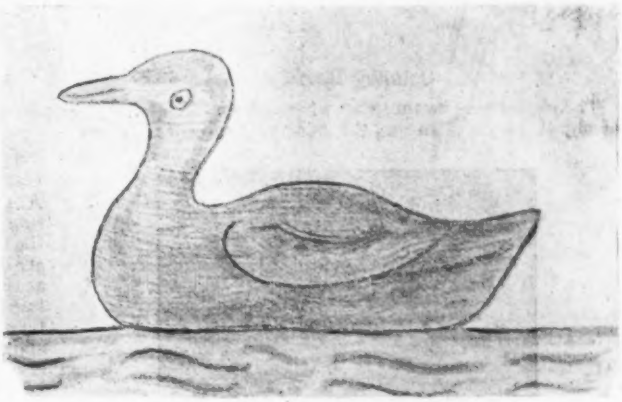
The full scheme of the "varied occupations" is as follows:—

DIVISION I. *Junior.*—Ball-making. (Wool.)
Bead and Reed Threading.
Kindergarten. Gift 1.
DIVISION II. *Middle.*—Cube-building.
Mat-weaving. (Smyrna wool.)
Tablet-laying.
DIVISION III. *Upper.*—Brush Drawing.
Ring-making.
Crayon-work. (Drawing.)
Straw and Paper Weaving.



Object Lessons.

Really the amount and variety of work one can see in a day in an interesting school is surprising. From "varied occupations" we pass on to object lessons. The two upper divisions took these, and they were both so beautifully arranged and completed that a description of them will be instructive. The lesson for the upper division was "Butter-making." Several girls from the dinner children had been put to shake a bottle of cream before afternoon school commenced. This was an essential operation, as, had it not been done, the butter would not have been produced in time to clinch the point of the lesson. The children of the class were told of the shaking, and several in turn took their share in completing it. Then, by means of diagrams on the blackboard and story-telling, the teacher explained what really happened in a dairy, and compared the bottle with a churn. When the butter was "found," it was washed out from the bottle on to a slab and salted. Then it was patted with butter-pats and made into a pretty shape, and tasted all round. The lesson was very complete. The middle division had a lesson on "Laying the Tea-table for Mother." The homely title of the lesson was indicative of the lesson itself. The cloth was laid, the tea-things arranged, cake and bread and butter cut, sugar put into the basin, the kettle put on the fire; in fact, everything was done exactly as it would have been done in the home. When tea was ready, several girls and boys were invited to partake of it. During this part of the lesson the writer was astonished to see how the children who had been left in their seats enjoyed watching the others at tea. He expected to see dull and discontented faces, which would have been perfectly natural. But here once more the high training of the children was in evidence, and stood out in a magnificent manner. They had been told at the commencement of the lesson that those who attended best to what teacher said should be those who would be invited to eat the good things provided; and as the selections were made one after the other, the children trusted to teacher to do what was right, and believed in her.



CRAYON WORK (OF CHILD AGED SIX YEARS).

One of the beauties in the object teaching—and it has been pointed out before in these interviews—was the amount of work done *by* the children themselves. They were their own demonstrators as far as possible, and from continued practice in this kind of thing they are entirely at home with it.

The following is the complete scheme of object lessons:—

DIVISION I. *Upper.*

1. The Blacksmith.
2. A Builder's Yard.
3. House-building.
4. Bread-making.
5. Butter-making.
6. The Post Office.
7. The Potato Plant.
8. The Harvest-field.
9. The Farm-yard.
10. Poisonous Plants.
11. A Ramble in the Park.
12. Fruit-trees.
13. The Oak.
14. The Owl.
15. A Railway Station.
16. A Visit to the Menagerie.
17. Spring.
18. Summer.
19. Autumn.
20. Winter.
21. Rain.
22. Snow.
23. A Ship.
24. A Sponge.
25. The Diver.
26. The Elephant.
27. Coal.
28. Salt.
29. Leather.
30. Good Manners.

DIVISION II. *Lower.*

1. The Horse.
2. The Cat and Kittens.
3. The Cow.
4. The Farm-yard.
5. A Butcher's Shop.
6. The Tea Plant.
7. Table-setting.
8. Summer.
9. Winter.
10. Spring.
11. Helping Mother.
12. Good Manners.

Country Rambles.

The reader may be sure that where such a splendid course of object lessons is in use, the value of rambles for nature-study is not lost sight of. The district affords splendid opportunities for this purpose. Almost every kind of British bird finds a home in the park; fishes of all sorts are to be found in the lakes; butterflies and insects exist in thousands; and plant life, from lichen to the giant oak, and beech, and fir, grows in luxuriance. There are dry and marshy spots, banks and hollows, open and shady places; while what the park itself does not afford, the country lanes and fields furnish. Wheat, root-crops, hay, and farm animals and implements are not omitted; and so completely has this branch of work been schemed, that advantage is to be taken in the course of the coming summer to visit a saw-mill in the neighbourhood. The cutting of timber can be seen in the park, and at the mill can be shown how the timber is made ready for use.

Number Teaching (Babies).

There is just time for one more lesson, and our interview must come to an end. It is the teaching of number four. As in other lessons, the children are appealed to by illustration and story-telling. The number is first of all shown on the top left-hand corner of the blackboard. Then four apples are drawn all in a row, and counted. Underneath, arranged as three and one, are four jars. These are supposed to contain flour for cooking purposes. By the side of the jars are four eggs in a nest. In the middle of the board the apples and eggs and flour are put all together in a bowl. On shelves are to be seen four more eggs and four jugs of milk; and, last of all, four apples are growing on a tree. The idea all throughout is to constantly have a repetition of the number. The story need not be told here as the teacher gave it to the class. It can, with the materials given, be thrown into almost any form. Interest and concentration are almost assured.

Dancing.

The day is over all too soon, and as a treat to the visitor, who has begun to think that little children *never* become wearied and tired, although he knows that older people do, the children of the upper division went through a very pretty Norwegian dance. The desks and tables and other impediments of the all too narrow space were removed. The boys arranged themselves in line down the full length of the room, the girls stood opposite, and, to the music of a lively tune, performed the dance very prettily. The dance is something like our well-beloved Roger de Coverley, and those teachers who know something of this will not be long in rearranging it into Norwegian form. Lightness of step is wanted particularly, and all movements must be exactly in time with the music.

The time-table, which shows a neat arrangement for the conduct of a small school, is appended.

TIME-TABLE—INFANTS' DEPARTMENT, HILL SCHOOL, SUTTON COLDFIELD.

Cl.	9 to 9.45.	10 to 10.30.	10.30 to 10.45.	10.45 to 11.	11 to 11.30.	11.30 to 12.		1.40 to 2.5.	2.5 to 2.30.	2.30 to 2.40.	2.40 to 3.15.	3.15 to 3.45.	3.45 to 4.
I.	HYMN, PRAYERS, AND RELIGIOUS TEACHING.	Writing.	Mental.	PLAYTIME.	Arithmetic.	Reading.	MONDAY.	Drawing.		PLAYTIME.	Object Less.	Tables.	DISMISSAL.
II.		Reading.	Word Bdg.		,,	Writing.		Needlework.			,,	Reading.	
III.		,,	,,		,,	,,		,,			,,	Tables (Objects).	
IV.		Writing.	Ball Frame.		,,	Alphabet.		Bead Threading.			,,	,,	
I.		Writing.	Word Bdg.		Musical Drill.	Reading.	TUESDAY.	Varied Occupations.			Arithmetic.	Recitation & Sing.	
II.		Reading.	,,		,,	Writing.		,,			,,	,,	
III.		,,	Mental.		,,	,,		,,			,,	,,	
IV.		Writing.	Number.		,,	Alphabet.					Ball Frame.	,,	
I.		Writing.	Mental.		Object Lesson.	Reading.	WEDNESDAY.	Arithmetic.	Object Less.		Phys. Exer.	Reading.	
II.		Reading.	Word Bdg.		,,	Writing.		,,	,,		,,	Writing.	
III.		,,	,,		,,	,,		,,	,,		,,	,,	
IV.		Writing.	Drawing.		,,	Alphabet.		,,	,,		,,	Reading.	
I.		Writing	Word Bdg.		Kindergarten.	Reading.	THURSDAY.	Drawing.			Arithmetic.	Writing.	
II.		Reading.	,,		,,	Writing.		Needlework.			,,	Reading.	
III.		,,	Mental.		,,	,,		,,			,,	,,	
IV.		Writing.	Ball Frame.		,,	Alphabet.		Ball Making.			Ball Frame.	Writing (Figures).	
I.		Writing.	Mental.		Arithmetic.	Sing. & Recit.	FRIDAY.	Drawing.			Reading.	Danc. or Fig. March.	
II.		Reading.	,,		,,	,,		,,			Writing.	,,	
III.		,,	Word Bdg.		,,	,,		Needlework.			,,	Drill or Marching.	
IV.		Writing.	Cubes.		,,	,,		Noah's Ark.			Reading.	,,	

Registration.—Registers are marked in the morning at 9.45, and finally closed at 10. In the afternoon marked at 1.30, and finally closed at 1.40.
Classes.—Class I. consists of six-year-olds; Class II., five-year-olds; Class III., four-year-olds; and Class IV., babies.
Divisions.—Division I. (Upper) consists of Classes I. and II.; Division II. (Middle), Class III.; and Division III. (Junior), Class IV.

OUR TUTORIAL SECTION

OUR PUPIL TEACHERS' AND SCHOLARSHIP COURSE.

BY ARTHUR T. FLUX,

Principal of the Belvedere Pupil Teachers' Centre, First on Scholarship List; Author of "Scholarship School Management," "Building of the British Empire," etc.

SCHOLARSHIP EXAMINATION, 1902.
Sixth Month—June.

Work for the Month.

1. *Reading.*—*Quentin Durward*, chaps. xxix.–xxxii. (For notes, see page 633.)

2. *Repetition.*—Ten or twelve lines per week. In both this and the preceding subjects oral practice is very essential to success.

3. *Teaching.*—The teaching of arithmetic, chap. vii., *Scholarship School Management.*

(I have been asked by several correspondents if it is necessary to study this subject, seeing that no paper will be set on it in the examination. The answer is, Yes, decidedly. Although there will be no separate paper, there will doubtless be questions in the other papers on the methods of teaching. And even if there were not, no student should omit the study of *the* subject which is of most practical utility to him.)

The teaching of arithmetic requires careful study, and proficiency in the art is the mark of the able teacher only. It may be taught by rule of thumb, by giving rules without any attempt at explanation, or by formulæ; but to do so is to miss the greatest educational object of the subject. Arithmetic is the most useful means of training children to think and reason for themselves. The working of any sums beyond the four simple rules by directions which are not understood is no test of progress; the solution of problems is. Hence the earnest teacher must make sure that the children understand the *reason* for every step they take. And the subject lends itself to this reasoning, because everything can be deduced or induced—arrived at, that is, by intelligent observation of previously-known facts, or by the examination of a few simple diagrams. The important points are detailed in the text-book, but one illustration may here be given. How many children understand the "borrowing and paying back" in subtraction? Probably none, since the method so generally taught is utterly wrong. Again, why should a fraction be inverted and multiplied by another when we want to divide? How would you prove to children that 30¼ square yards make a square pole? (These examples might be multiplied indefinitely, and to each the student must find an answer which is clear and convincing to a class of children.)

4. *Drawing.*—A freehand copy per week, from the flat or from nature. (Messrs. T. Nelson and Sons publish an excellent set of photos from the cast.)

5. *Music.*—Chap. vi., *School Music Teacher.* Time; time names; the teaching of time. Writing the various measures—the division of a pulse into halves, thirds, quarters, sixths, eighths. Rewriting—doubling or halving the duration of each note and rest. The time names for, also divisions of, a pulse, and the method of beating the various measures. Do not neglect this subject.

6. *Needlework.*—The cutting out, by proportion or by measurement, of a gored petticoat.

7. *Penmanship.*—Ten minutes' daily practice on *The Practical Teacher Copy Book* (specially written for this examination), and continual care at all times in writing.

8. *Spelling.*—One hundred words per week, from *Words Commonly Misspelt.*

9. *Composition.*—One or two essays each week, on such subjects as: "The Effects of the Discovery of the New World on European History;" "The Use and Abuse of Ridicule;" "The Child is Father of the Man;" "The Character of Dogs;" "The Use and Abuse of Advertisements;" the process of some manufacture; "Dreams;" "Elizabethan Writers."

Read these subjects up if necessary, and make out an analysis of your ideas before commencing to work. This may take longer than the actual writing, but it is most important: for example, take one of the foregoing subjects, "The Use and Abuse of Ridicule."

(1.) Define ridicule—the act of making a thing or person look absurd or ridiculous by words, spoken or written, or by acts.

(2.) Uses. Ridicule may be used for a good purpose—to cure a child of a silly habit, to point out to an adult the stupidity of some opinion, or to eliminate some social or national absurdity. Give instances. Addison, in the *Spectator* papers, laughed many absurd manners out of existence. Gilbert and Sullivan's comic opera, "Patience," effectually cured people of the æsthetic craze at one time prevalent, etc.

(3.) Ridicule is abused when it is undeserved. To ridicule a person for some physical defect or for a mistake for which there is some justification, or a child for some inadvertence, is cowardly. Some social evils are too serious to be ridiculed, and ridicule does harm by familiarising without diminishing them.

It is a powerful weapon, to be used with great discretion, as a doctor uses his lance—not at all on some occasions and unsparingly in others, as circumstances dictate.

10. *English.*—
(1.) Twenty-five roots and meanings per week.
(2.) The grammar and syntax of the adverb.
(3.) The literature of Stuart times.
(4.) *Julius Cæsar*, Act III., Scene 2.

Notes on the Adverb.

(1.) An adverb is a word which modifies the meaning of a verb, adjective, or adverb, *or anything equivalent to them.* Thus we may have an adverb modifying an adjective sentence; an adverbial phrase—as *hard*, in "Hard by yon wood;" an adverbial sentence—as *just*, in "Just when the day was over." Some grammars say that adverbs modify prepositions in such phrases as "close by the fire;" but it is preferable to consider them as modifying the whole adverbial phrase.

(2.) Learn a good classification—*Time, place, arrangement, repetition, manner, quantity* or *degree, affirmation, negation, cause* and *effect.*

(3.) Note the comparison of some adverbs.

Special Points.

(*a*) *Wherein, wherefrom, whereby*, etc., are called relative adverbs, being equal to *in which, from which*, etc.

(*b*) *Yes* and *no*, in answer to a question, are not adverbs, but word sentences—for example, "Did you see him? Yes." *Yes* here modifies nothing, but is equivalent to "I did see him."

(*c*) Note the forms *here, hither, hence; where, whither, whence; there, thither, thence.* The first in each case refers to rest *in* a place; the second, motion *towards*; the third, motion *away.* These are frequently misused—for example, from thence = from from there; *thence* is enough by itself.

(*d*) The adverbial object is of common occurrence—"he went *home*," "he ran a *mile*," "he is six *feet* high," "it weighed ten *pounds.*" These are *nouns* in the adverbial objective case.

(*e*) *There* is used as an introductory word in cases where the predicate precedes the nominative—"*there* lived a king." "*there* was a man," etc. It cannot be called an adverb of place, since in these instances it does not refer to place at all.

(*f*) Note the adverb *the* in such phrases as "*the* more *the* merrier." *The* in this case = *by this much*, and is an adverb of degree.

(*g*) *Passing* is an adverb, in "*passing* rich on forty pounds a year," though originally it was a participle (*passing* what is rich) governing a noun sentence.

(*h*) Some adverbs are derived from nouns—for example, *whilom* was a dative plural, meaning *at whiles. Needs* was an old genitive (= of necessity)—for example, "That needs must light on this ingratitude." *Meantime, sometime, midway, away, likewise*, etc., are compounds of adjectives and nouns in the objective case, and equal *in the mean time, at some time*, etc. *Abed, ashore, betimes, aloft*, are compounds of a preposition and noun.

Stuart Literature.—The student should know something of the chief writers and their thoughts. One most interesting point is the influence of the French Academy on English. "The stately tongue of England learned to dance the minuet of France." The French Academy had formulated laws which were accepted in England, and more attention was paid to mere versification than to thought. Poems were criticised not according to their meaning, but as to whether they fulfilled the artificial canons laid down by French taste; hence vigour and common sense were sacrificed to faultless metre.

The drama declined. The impure social life of the Stuarts produced plays to suit the unhealthy, prurient desires of the populace, and the breezy freshness of the Elizabethan drama was lost. The French critics demanded attention to *Les Trois Unités*—"the three unities" of time, place, and action—that is, they considered that the events in a drama should all occur within twenty-four hours, there should be no change of scene, and the play should deal with one tale only. Judged by this standard, Shakespeare was no dramatist. Take, for example, *The Merchant of Venice.* The time extends over some months, the scene changes continually, and there are three tales in it—the lady and the caskets, the avaricious Jew, and the elopement of the Jew's daughter.

Owing to these facts, there are comparatively few plays of the period which are widely read now. In prose works there is greater individuality. The names of Butler (*Hudibras*), Bunyan (*Pilgrim's Progress*), Newton, Locke, Milton, at once suggest themselves.

Notes on "Julius Cæsar" (continued).

(Students are invited to send up all difficulties. What puzzles one is probably a source of difficulty to another.)

(1.) We fear *prevention.* *Prevention* in this case means *to be forestalled*—going before with the idea of stopping.

(2.) *Presently* means nearly everywhere in the play *at once*, and not, as it does now, *after a while*.

(3.) *He is addressed.* He is prepared, *not* "spoken to."

(4.) *I must prevent thee, Cimber*, etc. This speech may be paraphrased as follows:—Such flattery and external shows of excessive respect as you are exhibiting might excite the pride of ordinary men and flatter their vanity so that their decisions, which should be as unalterable as the laws of the Medes and Persians, are reversed as frequently as the moods of a child change. Do not be so foolish as to think that I am susceptible to such flattery, or that my mind can be influenced by actions which might prevail with a fool. Your brother was banished by a decree of the senate after due deliberation. If this cringing is an introduction to an appeal for his recall, I kick it on one side as I would a troublesome cur. I have done no wrong by my decision, nor will it be altered without some very weighty evidence against it.

(5.) *To sound.* An infinitive limiting the noun *voice*.

(6.) *Freedom of repeal.* To be recalled from banishment and reinstated in full rights of a citizen.

(7.) *I do know but one. But* is an adverb modifying *one*, which is usually an adjective.

(8.) *Nor to no Roman else. Else* in this case limits *Roman*, and is an adjective.

(9.) *Stoop, friends, stoop*, etc. This part of the scene, depicting the conspirators dabbling in Cæsar's blood and talking boastfully about what would be done "ages hence," is weak and unnatural. A man like Brutus would recoil from smothering himself in blood; and such a practical politician as Cassius would know that there was much to do outside, and that immediately, and not lose time in talking about "states unborn and accents yet unknown."

(10.) *So oft. So* is correlative with *so* in the next line.

(11.) *So please him* = if it so please him.

(12.) *My misgiving still falls shrewdly to the purpose.* My anticipations of the future are generally correct. I am not often deceived in what I think will happen.

(13.) *Our arms in strength of malice*, etc. This passage is doubtless corrupt. The most natural explanation seems to be: "Our hearts, in the very height of the malice or ill-will against Cæsar, nevertheless receive you into friendship as a Roman and a brother"—that is, "even when we are most excited against Cæsar and his faction, we are willing to recognise you as a brother."

(14.) *Disposing.* Gerund, governed by *in*.

(15.) *Either a coward or a flatterer.* Antony means that as he was such a friend of Cæsar, to join immediately with his murderers would prove either that his friendship for Cæsar was mere flattery, or that he is such a coward that he is afraid of Brutus and his party.

(16.) *You know not what you do.* This is another instance of the superiority of Cassius as a practical man of the world over Brutus the philosophic student. Cassius's judgment was overridden twice—first, when he wished to include Antony in the assassination, and now when he protests against allowing him to address the citizens. This cost Brutus and Cassius their lives.

11. *Geography.*—

(1.) Revise in detail Asia generally—Asia Minor, Persia, Arabia, Afghanistan, and the central states.

(2.) British South Africa.

In revision pay particular attention to productions, imports, exports, towns, and government. The following questions will be of assistance in testing reading. They are all taken from Government examinations:—

(1.) What do you know of the government, trade, and political importance of Afghanistan?

(2.) Give some account of the following:—Chitral, Formosa, Fuji-san, Armenia, the Terai, Amur.

(3.) What do you know of the Caspian Sea and its shores?

(4.) Write an account of the Trans-Siberian Railway.

(5.) Write a short account of Japan or Persia.

(6.) Name two important groups of islands lying off the coast of Asia, and write fully about one of them.

(7.) The mountain chains which enclose the Chinese Empire form the highest watershed in the world. Name these mountain chains, and show the truth of the statement.

(8.) Say what you know about China as regards its people, productions, industries, and chief places of interest.

(9.) Say what you can of the Indo-Chinese peninsula, especially the Straits Settlements.

(10.) Show that the geography of Central Asia would furnish good illustrations for a lesson on climate.

British South Africa.—To understand the political geography of South Africa, the student must read up the history. It is impossible otherwise to form any idea of the forces at work during the past few years. If possible, a life of Cecil Rhodes should be read, and an account of the war. *The War in South Africa*, by A. Conan Doyle, is strongly recommended.

The following notes may be of use:—

Notes on Expansion in South Africa.

The Dutch first settled at the Cape in 1652, not with any idea of colonising, but rather to form a half-way house to India, at which ships could refit and obtain supplies of fresh vegetables and meat. Except for the immigration of some French Huguenots in 1689, the settlement advanced but very little. We took over the Cape in 1795, at the request of the Prince of Orange, to prevent it falling into the hands of the French. It was, however, restored in 1802, but finally passed into our possession in 1814. From that time till now the policy of the British Government in its treatment of the natives—Kafirs—and the Dutch settlers—Boers—has been one of continual change. Sometimes the attitude was threatening and bold, more often it was contemptibly weak. Wars with the Kafirs occurred in 1811, 1819, 1834, and 1846, each being followed by annexation of territory. The abolition of slavery in 1833, and subsequent misunderstanding with the Boers, led to many of them trekking into Natal and across the Vaal in 1835. Natal was annexed in 1843. In 1852, by the Sand River Convention, non-interference with the Transvaal Boers was promised, but the discovery of diamonds in 1867 led to the breaking of this arrangement. Ten years later, owing to the inability of the Boers in the Transvaal to hold the native tribes in check, the Transvaal was annexed under certain conditions, which the government of the time were so slow in carrying out that the Boers, in their mistrust of them, rose in rebellion in 1880; and after the disaster of Majuba Hill in 1881, Mr. Gladstone made the fatal mistake of restoring to them their independence. This was considered by the Boers as an act of weakness rather than magnanimity.

Bechuanaland was made a Crown colony in 1885, and the discovery of gold in the Rand district of the Transvaal revolutionised politics at the Cape. Johannesburg sprang into existence, and grew rapidly. The Boers taxed the immigrants heavily—the revenue rose from £40,000 to 4½ millions—but denied them any political rights.

Meanwhile extension was being made northward. Cecil John Rhodes, the son of the rector of Bishop-Stortford, had gone to the Cape on account of ill-health, and drifted to the diamond mines at Kimberley. Seeing the bad effects of the rivalry and underselling of the different diamond mines, he promulgated a scheme by which all the mines were placed under one directorate, and the output limited. He was laughed at as a dreamer, and a dreamer he certainly was, but many of his dreams were eminently practical. One of the earliest was to see the vast parklike district stretching to the north under British rule, and to see the British flag flying everywhere from "Lion's Head to Line," from the Cape to the Equator.

In 1889 the British South Africa Company was formed, and a charter issued to them giving them jurisdiction over some three-quarter million square miles. The following year a body of pioneers, under the great hunter F. C. Selous, penetrated Matabeleland and Mashonaland, and founded Fort Salisbury. The cost of conveyance of goods thither was, however, £80 per ton, and this difficulty no doubt suggested to Rhodes a railway from the Cape to Salisbury, and afterwards the continuation of the line *vid* Ujiji to the upper waters of the Nile, and thence down the river to Cairo. A rising of the Matabele was put down in 1893, and Buluwayo became the chief post of the Chartered Company.

The grievances of the mining population—"Uitlanders"—in Johannesburg led them to plot a revolt against the Transvaal Government. The rising did not take place, but the unfortunate Jameson Raid to assist in it did, and this put back the settlement of the question; and not only that, but the absence of the mounted police who had accompanied him led to another Matabele War. After some fighting this was concluded, mainly by the intrepidity of Rhodes, who went into the Matoppo Hills and held council with about sixty chiefs, and induced them to lay down their arms.

Then, at the end of 1899, the discussion between England and the Transvaal was broken off by the insulting ultimatum of the Boers, and the present war commenced. The chief incidents in this are doubtless well known.

The following states are comprised in British South Africa:—

1. Cape Colony—area, 277,077 square miles; pop., 1¾ millions.	A responsible government. Governor, Sir W. F. Hely Hutchinson. Legislative Council of 23, elected. House of Assembly of 95, elected.
2. Basutoland — area, 10,000 square miles; pop., 250,000.	Governed by a commissioner (Sir Godfrey Lagden) under the High Commissioner.
3. Bechuanaland Protectorate—area, 400,000 sq. miles; pop. 500,000.	Commissioner, R. C. Williams.
4. The Transvaal Colony (annexed October 25, 1900)—area, 120,000 sq. miles; pop., over 1,000,000.	At present under the High Commissioner. Lieutenant-Governor, Major Goold Adams.
5. The Orange River Colony (annexed May 28, 1900)—area, 50,000 sq. miles; pop., 200,000.	"
6. Natal—area, 29,000 square miles; pop., 1,000,000.	Responsible government. Governor, Sir Henry M'Callum. Legislative Council of 12. Legislative Assembly of 39.
7. Rhodesia—area, 750,000 sq. miles.	Governed by the British South Africa Company.

12. *History.*—The Tudors (1485–1603).

This period is one of immense importance, being the dawn of a new era, in which new methods of government, thought, and commerce, and new ideas in religion took their origin. It is the end of the superstitious, bigoted, narrow-minded dark ages when might was right; the dawn of enlightened manners and knowledge.

It is not possible to do more than indicate the chief points upon which the student must be prepared to answer fully and accurately.

(1.) The new monarchy—causes of almost absolute rule by the Tudors.

(2.) Methods of raising money—

Henry the Seventh, by confiscation of estates, war subsidies, loans and benevolences, Star Chamber, Morton's fork, Empson and Dudley.

Henry the Eighth, by First-fruits or Annates, confiscation of monastery land.

Elizabeth, by monopolies and taxes on trade.

(3.) Geographical exploration—the chief explorers, their nationality, the results of their discoveries upon trade.

(4.) The Renaissance, or revival of learning—its causes and results.

(5.) The Reformation—(*a*) causes; (*b*) points of which reform was necessary; (*c*) history of the movement at home and abroad; (*d*) results.

In connection with this, it is well to note the various religious sects in the later part of the period. The following table explains itself:—

Churchmen dividing after the Reformation into—
- (1) Roman Catholics.
- (2) Protestants, further divided into—
  - (*a*) Members of the Established Church.
  - (*b*) Nonconformists or Puritans—for example,
    - (i) Presbyterians.
    - (ii) Independents.
    - (iii) Quakers, etc.

(6.) The social life. Note the result of the suppression of monasteries on the poor—great distress, Pilgrimage of Grace, Ket's rebellion, attempts to settle the question by suppression of vagrancy, voluntary relief, etc., to the great poor laws of Elizabeth (*q.v.*).

(7.) Elizabethan literature—rich, bold, strong, and profuse.

(8.) Difficulties which Elizabeth met with at the beginning of her reign, and how they were overcome.

(9.) Vast development of trade—introduction of the weaving industry into England.

(10.) The policies of Wolsey, Cromwell, Somerset, Cecil, Lord Burleigh.

(11.) The political causes and results of the Armada—

Causes.—The final struggle of Roman Catholicism for supremacy.
Philip was hurt because Elizabeth refused his hand.
England had aided the Netherlands in their revolt against Spain.
English ships were continually plundering the Spanish main.
Drake's raid on Cadiz.

Results.—Protestantism saved. Elizabeth's position secure for the first time. England the first maritime power.

13. *Arithmetic.*—Simple and compound interest, with discount.

All simple interest sums must be worked by method of unity, and not by formula. Compound interest is best calculated by taking the fraction of the principal gained each year and adding it. For example, find compound interest on £2000 for 3 years at 5 per cent. Each year £5 will be gained on £100, or $\frac{1}{20}$ of the principal. State thus—

Principal for first year	= £2000		
Interest = $\frac{1}{20}$ of £2000	= 100		
Principal for second year	= £2100		
Interest = $\frac{1}{20}$ of £2100	= 105		
Principal for third year	= £2205		
Interest = $\frac{1}{20}$ of £2205	= 110	5s.	
Total	= £2315	5	
∴ interest	= £315	5	

14. *Algebra.*—Quadratic equations.

Work by formula. If $ax^2 + bx + c = 0$, then

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a},$$

which you should be able to establish.

Be able also to prove that a quadratic equation cannot have more than two roots, etc.

15. *Euclid.*—Revise Props. 9 to 16, Book I., with six deductions per week.

16. *Elementary Science.*—Chemistry of carbon dioxide, lime, silica, salt, iron oxide, mercuric oxide.

17. *General Information.*—Notes on questions in April No.:—

Flagrante delicto = taken in the act.

Caviare to the general. Caviare is prepared from the roe of the sturgeon, and is esteemed a delicacy by the epicure, but is beyond the appreciation of the ordinary man. Hence the expression is applied to anything which is understood and appreciated by the few—for example, Wagner's music. The phrase is from *Hamlet*.

As mad as a March hare. Hares are unusually wild and shy in March. It has been suggested that the phrase should be, "As mad as a marsh hare," because hares living on a marsh, where there is little cover, are much wilder than those living in or near woods.

The problem about the milkman was not solved by several. He fills the 3 pint, empties into the 5 pint. Fills the 3 pint again, and fills up the 5 pint. This leaves 1 pint in the 3 pint measure. He empties the 5 pint back into his can, then puts in the 1 pint, and adds 3 more.

Several students have asked me "how to prepare for this paper." I can only refer them to the notes appearing monthly since January in these columns. They are also invited to send up any points which puzzle them.

Answers to queries:—

(1.) Doubtful asks, "Is it possible to live sixteen years without a birthday?" Yes. This is an old query. A person can live all his life and never have a birthday, in this way. A ship travelling round the world from west to east drops a day in passing the meridian 180°. If, therefore, it reaches that line on the day before the man's birthday, the next day will be the day after his birthday. This may be done every year.

I have also seen it explained thus:—A person was born on February 29, 1896. There is no birthday due for four years. 1900 was not a leap year; that carries him to 1904. If he sailed from Russia to England, he would lose the one in 1904, owing to the difference in old and new reckoning; and in 1908 he may be on the Pacific, as above.

(2.) H.A.R. is patriotically anxious as to whether our navy could stand against submarine boats. I do not think he need worry. Submarine boats are at present experimental toys, notwithstanding French and American enthusiasm. The opinion of *The Engineer* is as follows:—"A feeble, unstable, dangerous craft, which dare not attempt to sink in rough water, cannot sink at all in less than a quarter to half an hour, and when down is as blind as a bat, and unable to move for even a mile with certainty of the direction in which she is moving. This craft, groping about at sea at two or three knots, could do little, save by chance, against a ship at anchor; against a moving fleet she would be absolutely useless."

(3.) "What is the strength of the British army and navy?" According to Whitaker, the army for 1901-2 consisted of:—Regular army (home and colonial), 207,215; army reserve, 90,000; militia, 187,541; yeomanry cavalry, 35,000; volunteers, 575,000; regular forces in India, 73,518—making a total of 971,970. This could easily be increased in case of a serious war. The navy consists of:—

Battleships, first class, 24 built, 14 building; second class, 11; third class, 10—total	59
Coast defence ships, 17; cruisers, first class, 25 built, 18 building; second class, 62; third class, 44—total	149
Gunboats	34
Destroyers	89
Torpedo boats, first class	95
	426

(4.) Apogee is the position of the sun when it is farthest from the earth. When it is nearest, it is said to be in perigee. Similarly the earth at these times is said to be in aphelion and perihelion respectively.

Questions for Competition.

(The answers to these questions are marked gratis. They should be sent *direct* to Mr. A. T. FLUX, The Bays, Belvedere, Kent, with a stamped addressed envelope for return. A prize of One Guinea is offered to the student obtaining the highest percentage of marks during the year.)

1. (*a*) What is the remainder after ·6814 has been divided by 3·17 to four places of decimals?

(*b*) An Arab left his camels to his three sons in the proportion of $\frac{1}{2}$, $\frac{1}{3}$, and $\frac{1}{9}$. There were 17 camels, and failing to see how to divide them, they called on an old chief, who said: "It is very easy. I will add one camel to your 17, making 18 in all. The eldest son takes his half, or 9; the next his third, or 6; and the third his ninth, or 2. Thus are your 17 camels apportioned, and I take mine back. Each of you has more than his proper share, and should be satisfied." Comment on the arrangement. Was it just? If not, who suffered?

2. Explain, as minutely and scientifically as you can, what happens when you prick your finger with a needle.

3. What does Shakespeare say is "wasteful and ridiculous excess"?

4. What is an epic poem? Name some of the world's greatest epics.

5. A person takes a railway ticket which passes him over the lines of three different railway companies. He pays all the fare to the first. Do the other two get any share of the fare? and if so, how is the sharing managed?

6. Take three or four animals (say, one carnivorous, one herbivorous, one rodent, one bird), and show how each is particularly adapted to the life it lives.

7. Point out anything you see wrong in the following:—

(*a*) Coleridge says the crescent moon was rising "with one star within her nether tip."

(*b*) "It was just past midnight, and the full moon had just risen above the horizon in the east."

(*c*) A change in the moon brings a change in the weather.

(*d*) There was a new moon on 7th October, and a total eclipse occurred on 14th October.

8. Are there such things as ghosts? If not, how do you account for authenticated instances of persons seeing ghosts?

Test Questions on the Month's Work.

(The answers to these are marked and returned for a nominal fee of one shilling.)

1. *Penmanship.*—Write as specimens of copy-setting:—

(*a*) Large Hand—*Philological.*

(*b*) Small Hand—*Along the cool, sequestered vale of life*
They kept the noiseless tenor of their way.

2. Explain the general principles upon which the teaching of arithmetic should be based.

3. Write an essay on the Coronation.

4. What are defective verbs? Mention half a dozen. Point out in what way they are defective, and give the derivations if you can.

5. Why is Shakespeare considered the world's greatest dramatist?

6. Point out any historical inaccuracies in the play of *Julius Cæsar*.

7. Compare the general build, and the occupations of the people, of Holland and Norway.

8. What do you know of the "Wonderland" of North Island?

9. Say what you can of the relations between (*a*) England and Scotland, or (*b*) England and Burgundy, prior to 1485.

10. How was money raised under the Yorkist and Lancastrian kings?

11. Work the following sums:—

(1.) A can reap in eight days a field which B takes nine days to reap. They work together at harvest, and earn £22, 10s. 6d.

between them. If they share it in proportion to the work they have respectively done, how much should each receive?

Ans. A, £11, 18s. 6d; B, £10, 12s. 0d.

(2.) I have one bottle of brandy and a second half full of water. I fill up the second from the first, shake it, and then pour back into the first bottle until it is full. Again I take the first bottle and pour from it into the second till it is full. What is the proportion of brandy in the second bottle?

Ans. ⅗ brandy.

(3.) How can I divide five half-crowns, six florins, and twenty-nine sixpences between two persons so that each shall have the same amount and the same number of coins?

Ans. 1, 5, 14; 4, 1, 15.

(4.) A ship is worth £9,475. For what sum must it be insured at £5, 5s. per cent. that the owner, in case of loss, may receive the value of the ship and the premium paid?

Ans. £10,000.

12. What do you understand by element, compound, atom, molecule, law of constant proportions? Upon what ground is it suggested that all the known elements are allotropic forms of one simple element?

PUPIL TEACHERS' COURSE FOR 1903.

The new Code makes practically no change in the syllabus of work for pupil teachers. The chief point to notice is that there will be henceforth no Government yearly examinations, and that although Schedule V. is retained in the Code, a note at the head says: "The following curriculum is framed so as to lead up to the King's Scholarship Examination, but may be varied by the managers, with the approval of the inspector, in any case." The abolition of examinations does not imply that there is to be any relaxation in study, for by paragraph 41 (*a*), "in each year of their engagement the inspector must be satisfied that they are properly taught and diligent in their studies." This will be tested by the examination of notebooks and exercise books, and also by the results of quarterly examinations.

With regard to the syllabus of studies, most of my readers would do well to work according to Schedule V., which covers the whole of the work for Scholarship in a satisfactory manner, excepting perhaps in the English, where a greater knowledge of English literature would be advisable, and reading should not be limited to the set books.

The work in this course will therefore be arranged on the basis of Schedule V., with additional notes on points which lie outside it. Three test examinations will be set during the year, and the answers to these examinations will afford sufficient evidence of progress.

One addition will be made. Boy pupil teachers should do more mathematics than is set. Both Euclid and algebra should be started from the very first, and every pupil teacher should endeavour to pass at least Stage 1 in mathematics before the Scholarship Examination.

Work for the Month.

1. *Teaching.*—Practise copy-setting on the blackboard.

2. *Reading.—Candidates.*—One of the Waverley novels. *Old Mortality*, by A. and C. Black, is recommended.

First Year.—One of the Waverley novels or one of Macaulay's *Essays*. *Old Mortality* or the essay on *Clive* or *Hastings*.

Second Year.—One of the Waverley novels or one of Macaulay's *Essays*. *Old Mortality* or the essay on *Clive* or *Hastings*.

Ample time must be allowed for this exercise, both oral and private. All pupil teachers should read as much as possible, and *one* book for a year is a very small amount. I should recommend students to read three or four of the Waverley novels—for example, *Quentin Durward*, *The Talisman*, *Ivanhoe*, *Old Mortality*, *The Monastery*, *The Abbot*. These may be obtained in the beautiful pocket edition on thin paper published by Messrs. T. Nelson and Sons at 2s. net. Several of Macaulay's *Essays*, especially the historical ones, should also be read.

3. *Repetition.*—Ten to fifteen lines per week.

Here, again, the amount set is very small. There are dozens of poems which should be committed to memory. Learning by heart is a faculty which needs development by exercise. I hope to give a note on this subject next month.

4. *English.—Candidates.*—Gray's *Elegy in a Country Churchyard*. (The edition by Ralph, Holland, and Co. is recommended.) Prepare the first four verses.

First Year.—Cowper's *Task*, Book V. (Ralph, Holland, and Co.); or Cowper's *Expostulation* (T. Nelson and Sons). Prepare lines 1–40, *The Task*; or lines 1–44, the *Expostulation*.

Second Year.—Milton's *Paradise Lost*, Book III. (T. Nelson and Sons). Prepare lines 1–76.

In preparing this work in English, the student should read up the Introduction and get a general knowledge of the writer and his aims before commencing the poem. Then the whole poem should be read through before the detailed study commences. It must be regarded more as literature than as a mere exercise in parsing and analysis.

5. *History.—Candidates.*—To the end of the Norman period.

The chief points to be noticed are:—The Saxon invasion; who the Saxons were, why they came, where they settled. The formation of one kingdom. The reign of Alfred, and why he is deservedly called the Great. Dunstan. The Danish invasions. The battle of Hastings and the causes leading to it. The Normans. Changes produced by the Conquest. The Feudal System. Henry the First's Charter. The Civil War in Stephen's reign.

First Year.—The Norman period.

Second Year.—Charles the First and the Commonwealth.

Pay particular attention to the causes which led up to the Civil War, not only the immediate ones, but the more remote one of the struggle between the crown and the people which had been going on for centuries, and also the struggle between the Puritans and the Episcopalians. Prepare a map to illustrate places mentioned. Learn lives of the chief men of action in the period. Note also the spirited foreign policy of Cromwell, and the reason why the republican form of government collapsed with his death.

6. *Geography.—Candidates.*—England; physical features, productions, industries. Use Nelson's *Geography Text-Book: The British Isles*, (6d.), or Blackie's *Manual of the British Isles*.

First Year.—France and Germany.

Second Year.—Africa, excluding British possessions.

This subject is one which, from its nature, requires the most methodical preparation. The enormous number of more or less isolated facts renders it necessary to do a considerable amount of learning by heart. It is pre-eminently a subject of *facts* and not of opinions, and it is the absence of a sufficient number of facts which constitutes the greatest weakness in geographical answers. There is only one method to be adopted to ensure success. Maps must be drawn for every country or section of country, not once only, but again and again, till the shape and names are indelibly fixed on the memory. The contents of the text-book must be carefully digested into a notebook and committed to memory. When a perfectly clear idea has been obtained of the country, its chief places, and the facts connected with industries, imports, exports, etc., then it is advisable to read any books of travel, geographical readers, etc., from which additional information may be gleaned; but wide reading is useless unless the leading facts are definitely learned first.

7. *Arithmetic.*—All students are strongly advised to use the text-book recommended—*New Arithmetic*, by Christian and Collar (A. M. Holden). It is pre-eminently *the* book for teachers.

Candidates.—Least Common Multiple. Chap. xix.

First Year.—Compound Proportion. Chap. xxxi.

Second Year.—Discount. Chap. xlii.

Work through all the examples given, or at least satisfy yourself that you can work each sum. If any difficulty is experienced send up for solution.

8. *Euclid.—Candidates.*—The definitions.

First Year.—Props. 1–6.

Second Year.—Props. 31–36, with four deductions per week. (Egan's Exercises on Books I. and II. is recommended for deductions.)

9. *Algebra.—Candidates.*—Chap. i. Hall and Knight (Macmillan).

First Year.—Addition and subtraction. Chaps. iii. and iv.

Second Year.—Factors. Chap. xvii. Every exercise in this chapter should be worked through most carefully.

10. *Elementary Science.*—Cartwright's "*Section One*" *Physiography* is recommended.

Candidates.—Mass, volume, density, and specific gravity.

First Year.—Changes of state produced by heat; expansion of solids, liquids, and gases; capacity for heat; latent heat, etc.

Second Year.—Properties, etc., of oxygen, hydrogen, nitrogen.

Test Questions.

Candidates.—1. Give the meaning and use of the suffixes in the following words:—Witchcraft, sailor, pipkin, knowledge, hatred, homestead, thirteen, seldom, grapple, shutter.

2. What were the chief results of the Roman occupation of England—(*a*) on the land (*b*) on the people? What were the chief Roman roads?

3. Why is it hotter in summer than in winter? Why does time vary with longitude and not with latitude?

4. Define a prime number, and write out the prime numbers from 1 to 100. When a number is divided by 360 by the factors 5, 8, 9, the remainders are 3, 7, 6, respectively. What is the whole remainder, and what would be the remainders if the order of the factors had been 9, 8, and 5?

5. What are the general properties of matter?

First Year.—1. What is the meaning of the prefixes in the following words:—Befriend, forswear, mistake, sandblind, withhold, twilight, welfare, counterfeit, innate, viscount, emphasis?

2. Why does Alfred deserve to be called the Great? Draw a map of England showing the part over which he ruled.

3. How did the reign of Edward the Confessor pave the way for the Norman Conquest?

4. Say what you can of the Great Plain of Europe.

5. "The rivers of Europe are of great assistance in internal communication." Show the truth of this statement.

6. (*a*) How long will it take £267, 10s. 1½d. to double itself at 5 per cent. simple interest? Ans. 20 years.

(*b*) What principal will amount to £305, 14s. 10½d. in thirteen years at 2½ per cent.? Ans. £230, 15s.

(c) At what rate will £2,345 amount to £2,916, 11s. 10½d. in 6½ years? Ans. 3½ per cent.

7. Define parallel straight lines, a circle, an angle. What is a postulate and an axiom?

8. Describe the construction of a mercurial thermometer.

Second Year.—1. If you see anything wrong with the following sentences, correct them and give your reasons—(1) I am reading one of the best books that has been written; (2) Let's you and I go home; (3) Dogs often turn round before laying down; (4) That's her whom I heard is the cleverest of the two.

2. What plots were formed against James the First, and why?

3. Show from the history of James the First's parliaments (1) the Stuart ideas of kingship, and (2) the growing power of the Puritans.

4. How has the physical formation of Africa hindered its exploration and development?

5. "The exploration of Africa has been largely the solution of river problems." Comment on this.

6. (a) If 22 men can dig a trench 420 yards long, 5 wide, 3 deep, in 350 days of 9 hours each, in how many days of 11 hours each will 252 men dig a trench 210 yards long, 3 wide, and 2 deep? Ans. 5 days.

(b) If 72 cwt. of lead cover a roof 48 feet long, 32 wide, with lead $\frac{1}{12}$ of an inch thick, what is the length of a roof 25 feet wide which requires 75 cwt. of lead $\frac{1}{8}$ of an inch thick to cover it? Ans. 42 feet, 8 inches.

(c) If 9 men can mow a square meadow in four days, in what time can 7 men mow a square meadow one-sixth as long again as the former? Ans. 7 days.

7. How could you prove the composition of water by analysis and synthesis?

CORRESPONDENCE: RULES.

To ensure an answer in the next issue, queries must be sent by the 15th of each month.

Name and address of sender, with coupon of current number of THE PRACTICAL TEACHER (and *nom de plume* if desired), must be enclosed.

As a rule, all replies will appear in the Correspondence Column; but any one desiring an immediate reply may obtain it by enclosing a stamped addressed envelope.

All communications and queries with regard to the PUPIL TEACHERS' AND SCHOLARSHIP COURSE should be addressed to "Mr. A. T. FLUX, The Bays, Belvedere, Kent."

ANSWERS TO CORRESPONDENTS.

Norwich.—I should advise you to enter a residential college if possible.

G.R.C. (Walton).—See rules for correspondents: enclose stamped addressed envelope.

Art.—You have paid no attention to the remarks on freehand in the course. The copy is too small, the proportion is incorrect, and the lining-in is too fine and "wiry." Smooth, bold lines are required.

Anxious.—Your question is answered above.

S.A.E. (Stevenage).—I know of no one book which will supply the information you ask for. You would get it in an encyclopædia or in the guide books to those places.

(*Other correspondents answered by post.*)

NOTES ON "QUENTIN DURWARD."

(*Continued.*)

(*N.B.—The pages refer to the New Century edition of the novel published by Messrs. T. Nelson and Sons, 35 Paternoster Row, London, E.C. 2s.*)

CHAPTER XXIX.

Page 432. *Colloquy.* Conversation; talk. (Lat. *con*, and *loquor* = I talk.)

A female in Moorish garb. One of the companions of Hayraddin the Bohemian, who was putting the astrologer on his guard against the king's anger, and doubtless informing him of the scenes through which Quentin had passed.

Though less intimated. See page 400, where the jester's attire is described.

What foot the patient halts upon. To halt is to go lame. The jester means, "It is easy to see where the weakness is."

Spangle. A small piece of bright metal usually stitched upon a garment to reflect the light.

433. *Mumble.* To chew slowly: generally used of persons and animals without teeth.

434. *Oriental.* Eastern in character. Courtiers in the East prostrate themselves before a monarch.

Page 434. *Apprehension.* The power of understanding and grasping a fact.

Mysteries. Something hidden from the common people. The famous Greek mysteries were conducted in a temple with closed doors.

Stoic. The Stoic philosophy, as taught by Zeno of Athens and his followers, was that the true man did not allow any external circumstances to affect his equanimity. Personal discomfort, worries, anxieties, and annoyances were things to be despised.

435. *Condign.* Well-merited.

Capet. Hugues, the founder of the French monarchy, was surnamed Capetus (clothed with a capot or monk's hood), because he always wore a clerical costume. Hence Capet became the family name of the French kings.

Charnels of St. Denis. The kings of France were for many years buried in the abbey of St. Denis, near Paris. *Charnels* = tombs; places for mortal remains. (Lat. *caro, carnis* = flesh.)

436. *Weakest because nearest*, etc. The astrologer is, of course, entirely wrong in his statements. The laws of gravitation were then unknown.

Specific falsehood. One actual undeniable lie. As a rule, the utterances and prophecies of the philosophers were too vague to be proved or disproved by subsequent facts.

438. *I am in years.* I am now old.

439. *Matthias Corvinus.* See note, page 558.

The emperor—that is, of Germany.

440. *Satellites.* Subordinates who always attended him.

Cord of the blessed St. Francis. See page 430, where Trois-Eschelles provides a rope.

Cabalistic signs. Combinations of letters, words, and numbers, meaningless to the uninitiated, but significant to one who understood the *cabala*, a mysterious science said to have been delivered to the Jews by revelation.

Magi. The wise men of the East; the three kings.

CHAPTER XXX.

443. *Paroxysm.* A violent fit.

444. *Appanages.* Territories belonging to the Crown.

445. *Pretensions.* Claims or expectations upon French estates.

Apologue. Parable or fable. The fable referred to is one of Æsop's. A countryman picked up a venomous snake which was rendered torpid by the cold. The fox advised the man to kill it; but he refused, and placed it in his bosom. The warmth revived it, and it then bit its preserver. The moral urged by the count is, "When you have a dangerous enemy in your power, kill him."

Sanguinary. Bloody. (Lat. *sanguis, sanguinis*, "blood.")

446. *Have you heard the gold of France clink?* Have you been bribed by the French king?

447. *Fomenter.* Instigator. *To foment* is to bathe with warm water in order to bring an eruption to a head; so it is used metaphorically of one who instigates to revolt.

Emissaries. Messengers sent on a special errand. Lat. *e, mitto* = I send.

Minute down. Write down in brief. The "minutes" of a meeting are a condensed account of what took place.

448. *Depend on the cast of a dice.* Depend upon mere chance. When dice are thrown, no one can tell which number is going to turn up.

Litter. A bed or seat slung on poles between two horses. Roads were too rough for carriages.

Feudal delinquency. A breach of the laws regulating the behaviour of a vassal towards a superior. Nobles had nearly unlimited power over the persons and fortunes of heiresses under their jurisdiction.

449. *Dog leash.* The leather strap by which a dog is led.

Carcanet. A collar of jewels.

Statist. A statesman, politician; one well versed in statistics.

450. *Grand Falconer.* In the days when hawking formed one of the chief pastimes of the great, the head falconer was a person of much importance, and it was not considered derogatory in a man of rank to hold the office. But the Grand Falconer did none of the menial work—the feeding and physicking of kites—any more than the king's Master of Horse grooms his horses.

Kites. Rapacious birds of the hawk kind.

451. *Tropes.* Figures of speech.

452. *Right to strike money.* The right of coining money was always regarded as the special privilege of kings only. Not only was it a source of revenue, but each coin was a continual reminder to the possessor of his relation to his sovereign.

Representative of Charlemagne. The French kings were descended from Charlemagne, the great emperor who ruled nearly all Western Europe in the days of Egbert. On his death the empire fell to pieces, and formed independent states under different names and rulers.

Smeared with oil. Anointed at the coronation.

Ducal coronet. A coronet is a small crown worn by the nobility, the different patterns being indicative of the rank of the wearer. They are all open at the top. To "close it and surmount it with a globe" is to make it into a king's crown.

453. *Exculpation.* A freeing from all blame.

Væ victis. Lat. "woe to the vanquished."

Aconite. Poison, derived from the plant wolfsbane or monkshood.

455. *Patriarch.* Abraham. (See Gen. xxii.)

456. *Tête-bottê.* Booted head.

Galling to the quick. Galling is the soreness produced upon any part of the body by continual friction or pressure. If this is continued, the outer skin is worn away and the *cutis* or "quick" laid bare. This causes acute pain. Hence in this case "galling to the quick" means "causing intense pain."

457. *Labyrinth.* A place or position full of inextricable windings; so called from Labyris, an Egyptian monarch. There have been many labyrinths or mazes famous in history.

458. *Premises.* Preliminary statements put forward.

462. *Child of France.* One of the princes of the blood-royal.

Varium et mutabile semper femina. Lat. "woman is ever changeable and fickle."

Howlet. A young owl, which is very awkward and stupid in appearance.

464. *Monitor.* Adviser. (Lat. *moneo*, "I advise.")

Page 464. *Trout properly tickled.* This refers to a peculiar method of catching trout. If they are gently tickled underneath, they remain stationary, and may be easily caught with the hand.

465. *Leviathan.* The leviathan mentioned in the Book of Job, the Psalms, and the Book of Isaiah was either the crocodile or some extinct sea monster. The term is now applied to the whale or to any huge animal of the sea, and metaphorically to a large vessel. Louis uses it with contempt, as referring to one possessing more bulk and strength than brains.

Entrails. The viscera, the vital organs of the body.

CHAPTER XXXI.

Apostle's sense. This phrase was originally used by Christ: "Make to yourselves friends by means of the mammon of unrighteousness"—that is, money.

466. *Hors de page.* Out of my apprenticeship as a page—that is, before I became a squire.

Shool. Shovel; the broad flat board which a baker uses to place loaves in an oven or to withdraw them.

Wallace wight. Wallace was the hero of the Scottish War of Independence in the reign of Edward I. *Wight* usually means a person (A.S. *wiht* = a creature, person, thing). *Wight* in this phrase means *strong, active*, and is derived from the Icelandic *vigt* = serviceable for war. Scott uses the same phrase in *Marmion*—"Oh for one hour of Wallace wight!"

467. *Ambuscade.* Ambush; a sudden attack. (Low Lat. *imboscare* = to lie hidden in a bush or thicket.)

468. *Midrif.* The diaphragm, a strong muscular membrane dividing the thorax from the abdomen. The modern phrase is, "It wounds me to the heart."

Breviary. A book containing the daily services of the Roman Catholic Church.

Ken. Know.

Braw callant. Brave lad.

469. *Routier.* Fr. a brigand; a man who lives lawlessly.

Daffing. Loose talk; jesting.

Souter. Shoemaker; cobbler. (Lat. *sutor* = I sew.)

Curney. Lot; group.

Be made. Be established in a fortunate position.

471. *Blate.* Modest; bashful.

Minting at. Aiming at. (A.S. *myntan* = to purpose; try.)

472. *Whilly-whawing.* Talking quietly in a lover-like manner.

473. *Derogation.* Acting in manner below the dignity of her position.

476. *Malapert.* Forward; saucy; impudent.

GENERAL INFORMATION FOR SCHOLARSHIP.

"FAMILIARITY breeds contempt" runs the old copy-book headline, and the systematic gatherer of "general information" must be on his guard lest, in his eagerness to make himself familiar with abstruse subjects, he overlook those that lie, as it were, at his very door. How many articles of every-day use there are of which we know very little! The very fact that we have always been accustomed to see these things about us leads us to neglect making any inquiries about them, in the same way that the inhabitants of any particular place seldom visit the objects of interest in their own locality. This applies particularly to such homely articles as arrowroot, soda, etc.—articles which we are so accustomed to find ready for our use that we seldom stop to consider what they are or where they come from.

The lists of exports, imports, and manufactures found in the geography manuals will furnish the names of many substances used in the arts and manufactures of which it is necessary to have some knowledge.

Special attention should be paid to any article having a misleading name, such as catgut, for example, which is made from the intestines of the sheep, not of the cat; and also to those chemicals which are known commercially under different names from those which the chemist usually uses for them.

In this way the student will acquire a stock of general information which will be of service, not only at the Scholarship Examination, but through the whole of his career as a teacher.

We now give a few pages from our own notebook, showing the amount of information that can be acquired in the way we have indicated—although, of course, it is only the list of names that we get in this way; any information that we require must be obtained by consulting our encyclopædia.

Food-stuffs.

Arrowroot is a starch obtained from the underground stems of certain trees that grow in the West Indies and other warm countries. The stem is beaten and the starch washed out of it.

Sago is obtained from the sago-palm of the East Indies. The soft interior of the stem is nearly destitute of woody fibre, the cells being filled with starch, which is washed out and then dried.

Tapioca is obtained from a deadly poisonous plant found in South America.

Macaroni and *Vermicelli* are made from the finest wheaten flour, which is made into a paste and dried.

Cochineal is obtained from a small insect (*Cossus cacti*) found in many parts of South America.

Isinglass.—The finest isinglass is prepared in Russia from the air-bladder and sounds of the sturgeon.

Caviare.—The same royal fish supplies us with this delicacy, which is prepared from the roe.

Spices.

Allspice is the fruit of a tree of the myrtle order cultivated in Jamaica.

Cinnamon is the bark of a kind of laurel.

Cloves are the dried flower-buds of a small tree of the myrtle order found in the Moluccas.

Ginger is the underground stem of a plant resembling the iris. When the stalk withers, the root-stock is taken up, dried, and scraped.

Nutmegs are the seeds of a plant of the laurel order. Each seed is surrounded by a sort of netted covering; when dried, this covering is known as *Mace*.

Pepper is the fruit or berry of a climbing plant found in the East and West Indies.

Turning to articles used in the manufactures, we find the following:—

Dyes.

Vegetable dyes are obtained from the wood, bark, or leaves of many plants, the chief being:—*Indigo*, the juice of the leaves of a plant (*Indigofera*) belonging to the order Leguminosæ, which grows in almost all parts of the Torrid Zone; *logwood*, another tree of the same order, the heartwood of which yields a violet or purple dye, which can be converted into a black by proper treatment; *Brazil-wood* and *Nicaragua-wood*, which yield red dyes; *fustic*, a yellow dye largely used in calico printing, obtained from the wood of a tree resembling the mulberry which grows in Brazil; *arnatto* or *anatto*, used to impart a rich golden hue to butter and cheese, obtained from the pod of the arnatto tree, a native of the East and West Indies; *turmeric*, which is used for colouring pickles, etc., a yellow dye obtained from the root of an East Indian plant.

Aniline colours, which are the most beautiful of any employed by the dyer, are obtained from the refuse of the gas-factories. Among the gases which pass out of the retorts are numerous compounds of carbon and hydrogen, and these are made to yield aniline. This can be converted into most brilliant colouring substances.

Fibrous Materials.

Fibrous materials, as employed in the arts, are so numerous that even a bare list of them would be of considerable length. We will merely notice the following. *Flax* and *hemp* are both obtained from the stems of plants; *jute* is also obtained from the fibrous stem of a plant, but is much coarser than hemp or flax, and is largely used for sacking and bagging; the Hindus make a coarse cloth from jute called *gunny cloth*, which is used for packing the raw cotton; *coir* is the fibrous covering of the cocoa-nut, which is used in the making of ropes and cordage; *mohair* is the wool of the Angora goat, found in Asia Minor; *alpaca* is the wool of an animal resembling the llama, found in South America.

Space will not permit us to treat in the same manner all the articles which we have under the headings of gums, spirits, oils, timbers, chemicals, metals, and alloys, etc., so we will quote a few of them.

Amber is found in small irregular pieces on the shores of the Baltic; it is the gummy exudation from certain trees now extinct.

Asbestos is a peculiar fibrous mineral substance; the fibres can be easily separated and spun into cloth; it is largely used, owing to the fact that it is incombustible.

Shagreen is the leather made by drying a skin without tanning it.

Esparto grass is a plant which grows something like English rushes. Over half a million tons of esparto is imported into this country from Spain and Southern Europe, and is used for making paper.

Cinchona is the bark of a tree grown in Peru, from which quinine is extracted.

All scholarship students should carefully study the article on the Coronation in this month's PRACTICAL TEACHER, and make notes on the subject from the newspapers.

OUR CERTIFICATE COURSE FOR 1902.

BY GEORGE COLLAR, B.A., B.SC.,
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We have now reached the stage for final revision, and as the examination follows almost immediately on the issue of our July number, and will leave no time to work up weak points discovered then, we are giving this month a complete set of papers in all subjects on the same lines as those in the Certificate Examination itself. We strongly recommend our readers to take each paper and answer it in the time allotted, and without previous reference to notes or text-books. The written answers should then be submitted to some competent person for criticism, or failing that, the student may check his own answers by the text-books, and all weak points should be attended to and answers prepared to the questions not attempted in the time. Answers to questions in arithmetic and mathematics will be given next month.

English Composition (Men and Women).

(One hour.)

Write in plain prose an essay on *one* of the following subjects:—

1. Imperial Federation.
2. Sympathy.
3. "Our sweetest songs are those
   Which tell of saddest thoughts."
4. Newspapers.

Theory of Teaching (Men and Women).

(Three hours allowed. Answer two questions from each section.)

Section I.

1. In what ways is the arrangement of a school time-table dependent on the plan and arrangement of the school building?
2. In what ways would a class of children benefit by a visit to a museum or place of historical interest? Describe in detail the steps you would take in organising such a visit, so that the greatest possible benefit might accrue to the scholars.
3. What special rules apply to the registration of children—(*a*) attending cookery centres, (*b*) absent on account of their own illness, (*c*) absent on account of infectious diseases in their family?

Section II.

1. What points should be observed by a teacher in questioning his class, and what are the characteristics of a good answer?
2. What are the purposes of home lessons? What are the abuses to be guarded against?
3. To what extent should map-drawing be considered as an art in itself, and to what extent an aid to geography teaching? How would you teach children to draw maps from memory?
4. How and to what extent would you teach generalisations in arithmetic to children in an elementary school?

Section III.

1. What do you understand by the "concentric plan" of teaching history?
2. Distinguish between "temperament" and "character." How may children be classified according to temperament?
3. What is meant by "apperception"? What principles should guide you in drawing up the "introduction" in notes of lessons?
4. How does memory differ from imagination? and how may a teacher improve the memory of his pupils?

Section IV.

1. Explain what is meant by the intension and extension of a term.
2. What is a syllogism? Of what parts does it consist?
3. What do you mean by "connotation," "equivocation," "cross-division," and "ambiguity"?

Section V.

1. Give some of Locke's recommendations which may be good for a private tutor or parent, but which are not practicable for a class teacher.
2. What devices does Locke recommend in beginning to teach children to read?
3. What reasons does Locke give for teaching arithmetic, and with what other subjects does he associate it?
4. Give a sketch of Locke's views on the question of rewards and punishments.

English Language and Literature (Men and Women).

(Three hours. Answer two questions from each section.)

Section I.

1. Explain thoroughly the meaning of *three* of the following passages, indicating the context in which they occur:—

(*a*) "Then live, Macduff: what need I fear of thee?
But yet I'll make assurance double sure,
And take a bond of fate: thou shalt not live;
That I may tell pale-hearted fear it lies,
And sleep in spite of thunder."

(*b*) "Glamis thou art, and Cawdor, and shalt be
What thou art promised: yet do I fear thy nature;
It is too full o' the milk of human kindness
To catch the nearest way: thou wouldst be great;
Art not without ambition, but without
The illness should attend it: what thou wouldst highly,
That wouldst thou holily; wouldst not play false,
And yet wouldst wrongly win: thou'dst have, great Glamis,
That which cries, 'Thus must thou do, if thou have it;
And that which rather thou dost fear to do
Than wishest should be undone.'"

(*c*) "'Tis better thee without than he within.
Is he dispatched?
Mur. My lord, his throat is cut; that did I for him.
Mac. Thou art the best o' the cut-throats; yet he's good
That did the same for Fleance: if thou didst it,
Thou art the nonpareil."

(*d*) "There are a crew of wretched souls
That stay his cure: their malady convinces
The great assay of art; but at his touch,
Such sanctity hath Heaven given his hand,
They presently amend."

2. Write an account of the character of Lady Macbeth, illustrating your answer by quotations.
3. Explain the following phrases:—"Gouts of blood;" "the very stones prate of my whereabout;" "there's daggers;" "champion me to the utterance;" "I cannot strike at wretched kerns."

Section II.

1. Explain the following passages, noting their context:—

(*a*) "Him the Almighty Power
Hurled headlong flaming from the ethereal sky,
With hideous ruin and combustion, down
To bottomless perdition; there to dwell
In adamantine chains and penal fire,
Who durst defy the Omnipotent to arms."

(*b*) "Sage he stood,
With Atlantean shoulders fit to bear
The weight of mightiest monarchies: his look
Drew audience and attention still as night
Or summer's noontide air."

(*c*) "Let such bethink them, if the sleepy drench
Of that forgetful lake benumb not still,
That in our proper motion we ascend
Up to our native seat; descent and fall
To us is adverse."

(*d*) "Nor did Israel 'scape
The infection, when their borrowed gold composed
The calf in Oreb; and the rebel king
Doubled that sin in Bethel and in Dan,
Likening his Maker to the grazed ox."

2. What are the characteristics of epic poetry? Show that *Paradise Lost* is a grand example of an epic poem, and name other epics.
3. Give examples of forms and expressions used by Milton in imitation of the Latin.

Section III.

1. Give a short account of the life of Dr. Arnold.

2. What qualities of Dr. Arnold made him great as a schoolmaster?

3. Name some of the people to whom Arnold's letters were addressed, and give the subject-matter of his correspondence with one of them.

Arithmetic (Women).

(Three hours allowed. All questions to be answered. The use of algebraical methods is allowed.)

1. Explain and correct the error in the following:—

$$47625 \div 9 = 5291 + 6.$$

2. State and explain the rule for division of decimals, and find correct to three places $46{\cdot}2104863 \div 9{\cdot}84379526$.

3. Find by the shortest method the cost of 4,685 things at £5, 19s. 7½d. each.

4. A market gardener planted 214,369 lettuces, so that the number of plants in a row was equal to the number of rows. How many rows were there? and if each lettuce was 9 inches from the one nearest to it, what was the area planted?

5. A man rows 8½ miles an hour with the stream, and 3¾ miles an hour against it. He rows from A to B and back in 1 hour 48 minutes. What is the distance between A and B?

6. The bill for repairs to a house which is about to be sold amounts to £65. If the seller pays this amount, he will lose 5 per cent. on what he paid for the house, but will gain 5 per cent. if the buyer pays the bill. How much did the house originally cost?

7. Find the true discount on a bill for £1,319, 10s. due on 19th June, and discounted 12th January, the interest being at the rate of 4½ per cent. per annum.

8. Which is the better investment, and by how much per cent.—3½ per cent. stock at 98 or 4½ per cent. stock at 121?

9. A man buys 30 gallons of spirit at 18s. 4d. per gallon. How much water must he add if he is to sell it at 1s. 3d. per gallon less, and at the same time make a profit of 5 per cent.?

10. In 1901 a man paid income-tax on 36 per cent. of his income. In 1902 his income increased by 20 per cent., and he had to pay on 46¾ per cent. of it, the tax itself being increased by 16¾ per cent. By how much per cent. was the total income-tax of the man increased?

Geography (Men and Women).

(Two hours. Answer seven questions.)

1. Draw a sketch-map of the Balkan Peninsula, indicating as nearly as you can the political divisions at the close of the struggle for Greek independence.

2. Account for the importance of the following ports—Hamburg, Marseilles, Cadiz, Brindisi, and Bergen.

3. Describe the chief districts in Europe in which coal is found.

4. Write a short account of the kingdom of Bavaria.

5. Where are the following places, and how are they connected with the history of Europe (1814–1848)—Navarino, Missolonghi, Carlsbad, Fontainebleau, Ostrolenka, and Segura?

6. What manufactures are carried on in the following towns: Leipzig, Mülhausen, Essen, Malines, Verviers, and Creuzot?

7. Give an account of the commerce of Spain.

8. In which parts of Europe are the following minerals found: mercury, platinum, copper, plumbago, and lead?

9. Name the chief lines of steamships trading between English and Continental ports.

10. How do you account for the prosperity of Switzerland?

History (Men and Women).

(Two hours. Answer seven questions.)

1. Write a life of Metternich or of Cavour.

2. Give an outline account of the War of Greek Independence.

3. Trace the history of Russia from 1814 to 1848.

4. Write a short account of the Waterloo campaign.

5. From what internal troubles were the Austrian dominions suffering during the period 1814–1848?

6. What great movements took place in the literature of Europe during the first half of the nineteenth century?

7. What causes led to the revolt of the southern provinces of the Netherlands?

8. Give an outline of the history of Spain during the years 1814–1848.

9. What attempts were made to replace constitutional governments by absolute monarchies in European states in the first half of the nineteenth century?

10. What was the *Zollverein?* Compare it with any scheme recently proposed for the establishment of a customs union between the different parts of the British Empire.

Algebra and Trigonometry (Men only).

(Three hours. Answer ten questions.)

1. A body falls $16\frac{1}{16}$ feet in the first second, 3 times as far the second second, 5 times as far the third second, etc. How far will it fall in 11 seconds?

2. From 11 Conservatives and 10 Liberals how many different committees can be formed, consisting of 6 Conservatives and 5 Liberals?

3. A company of a soldiers is joined by another company of b soldiers. In how many ways is it possible to leave c of them to garrison the fort and send the rest on two expeditions, requiring respectively d and e men?

4. Prove the formula for obtaining the sum of an infinite series in G.P., and find the sum of $9 + 3\sqrt{3} + 3 + \ldots$ to infinity, correct to two places of decimals.

5. Two pipes running together can fill a cistern in 2 hrs. 24 minutes. The smaller pipe alone would take 2 hours longer than the larger one alone. In what time would each pipe alone fill the cistern?

6. The product of two numbers is 4032. One number is formed by reversing the digits of the other, and the ratio between the numbers is 4 : 7. Find the numbers.

7. Having given $\log 2 = 3010300$, $\log 3 = 4771213$, and $\log 7 = 8450980$, find the logarithms of 128, 36, 4900, $\sqrt[3]{21}$, $\sqrt[5]{\cdot 14}$, and $7\frac{3}{4}$.

8. What is the position of the first significant figure of the numbers whose logarithms are: $4{\cdot}3031961$, $2{\cdot}0453230$, $\bar{4}{\cdot}7403627$, $\bar{2}{\cdot}3617278$; and what are the characteristics of the logarithms of $486{\cdot}0000285$, $4729{\cdot}83$, and $\cdot 0275$?

9. Give the 16th term of $(1 - 2a)^{20}$, and the coefficient of a^9 in the expansion of $(a^3 + a)^5$.

10. Show that $\tan A + \cot A = \sec A \operatorname{cosec} A$.

11. Determine geometrically the values of tan 45°, sin 60°, and cosec 45°.

12. Multiply £7, 16s. 9d. by sin 30°, and divide 87 tons by tan 60°, correct to two places of decimals.

13. Prove that the tangents of 60°, 45°, and 15° are in arithmetical progression.

14. Prove that $\cos C = \dfrac{a^2 + b^2 - c^2}{2ab}$.

15. Show that $\dfrac{\tan 3A}{\tan A} = \dfrac{2\cos 2A + 1}{2\cos 2A - 1}$.

Geometry (Men only).

(Three hours. Answer all the questions.)

1. ABCD is a quadrilateral, in which the diagonal AC equals the side AD; show that the other diagonal DD cannot be equal to the side BC.

Enunciate the proposition needed for the proof. Show also that BD is longer than BC, and enunciate the proposition needed for proving this.

2. Equal triangles upon the same side of the same base are between the same parallels.

Show that the straight line which joins the middle points of two sides of a triangle is parallel to the third side.

3. Prove that the sum of the squares on two sides of a triangle is double the sum of the squares on half the base and on the line joining the vertex to the middle point of the base.

4. Prove that the difference of the squares on any two lines is equal to the rectangle contained by the sum of the lines and their difference.

5. On a given straight line describe a segment of a circle containing an angle equal to a given angle.

Find a point O within a triangle ABC such that the angles AOB, AOC, and BOC shall be equal. When is this impossible?

6. Inscribe a circle in a given triangle. Show also how to describe a circle touching one of the sides and the other two sides produced.

7. Produce the given line AB to a point C, so that the square on AC shall be twice the square on BC.

8. Prove that the areas of similar triangles are to one another as the squares described upon a pair of homologous sides.

Political Economy (Men and Women).

(Three hours. Answer six questions.)

1. What is a "trust"? Criticise the formation and operation of trusts from the point of view of political economy.

2. What are the uses of money? What would be the effect upon prices if the number of bank notes in circulation were greatly increased?

3. What are the reasons for and against the reduction of the National Debt?

4. What are the factors which determine *cost of production?*
5. What is meant by "reciprocity" in commerce? Give the arguments for and against it. What advantages and what disadvantages would attend the establishment of a customs union for the British Empire?
6. State Ricardo's theory of rent. Can a similar theory be put forward in regard to wages?
7. What is co-operation? To what extent has it been successful? Distinguish between co-operation in production and co-operative stores.
8. What do you mean by "division of labour"? Give examples, and show the advantages of it.
9. Explain clearly the difference between direct and indirect taxation, and state the four fundamental principles of taxation.
10. What do you mean by the ultimate incidence of taxation? Discuss the incidence of the export tax on coal.

FRENCH (MEN AND WOMEN).

(Two hours. Answer Section I. and one other section.)

I.

Translate into English A and either B or C:—

A.

A. Mes deux lettres...tu ne les as donc pas reçues?
N. Rien...je n'ai rien reçu.
A. Ma lettre a dû arriver hier.
N. Hier!...Depuis qu'on n'attend plus rien de toi, on n'envoie plus chercher les lettres à la ville.
A. Mais vos autres lettres?
N. Oh! celles-là, elles viennent quand elles veulent.
A. Et ma mère?...
N. Elle vous croit toujours mort.
A. Mort!
N. Ah! la malheureuse, quel coup de foudre!
A. Ainsi, elle n'est donc pas préparée à mon retour?
N. Est-ce que j'y étais préparé, moi?...Mais j'y pense, quelqu'un t'a peut-être vu entrer ici?...N'as-tu pas rencontré quelqu'un?
A. Personne...J'étais même inquiet de ce que vous ne veniez pas tous à ma rencontre.

MADAME DE GIRARDIN, *La Joie fait Peur.*

B.

Le chameau est l'image du désert: grand, maigre, difforme, monotone, patient, mais d'un caractère sauvage et méchant quand il est poussé à bout. Une livre de fèves, d'orge, ou de noyaux de dattes, et une livre d'eau, lui suffisent. Il reste quatre ou cinq jours sans boire, quelquefois jusqu'à six et sept, mais alors il souffre. Il passe plusieurs jours sans manger. Son lait, son fromage, sa chair, nourrissent l'Arabe; son crin, sa peau, l'habillent et forment ses tentes. Le chameau est une bête de somme, il n'est pas bâti pour traîner; il porte autant que trois chevaux; c'est le navire du désert. Chargé et à son pas naturel, il marche dix-huit heures avec un repos d'une heure.

C.

Les siècles se suivent, dit-on souvent, on devrait dire qu'ils s'engendrent. Aujourd'hui est le fils d'hier, et de tous les innombrables hier qui le précèdent. Le présent est le résumé du passé. Telle de nos institutions forme à elle seule un chapitre de l'histoire de France tout entier. Donc, étudier ce qui fut, à la lumière de ce qui est, c'est en comprendre le but, c'est en apprécier le développement, c'est en saisir le fil. Beaucoup de faits historiques, étudiés chronologiquement, restent obscurs parce qu'on ne sait pas où ils conduisent. Mais que tels ou tels événements, inexplicables ou monstrueux, vous apparaissent non plus comme une halte dans les ténèbres ou dans le sang, mais comme une étape vers un avenir que vous connaissez, alors tout change, tout s'explique, tout prend de l'intérêt.

II.

1. Give the future first person singular of *savoir, mouvoir, pouvoir, voir, pourvoir, asseoir.*
2. Translate: "She has amused herself" (*s'amuser*); "she has hurt herself" (*se nuire*); "they would have told you" (*dire*); "would she have remembered?" (*se souvenir*); "she would not."
3. What is the use of the accent grave? Which are the verbs and adjectives which require it, and when? Give instances. What is the cedilla? In what tenses and forms of the verbs *placer* and *recevoir* is it necessary?
4. Give the feminine forms corresponding to *ambassadeur, directeur, flatteur, vengeur, malin, marin, vain, mignon, léger, premier, complet, sec, franc, turc.* Give the masculine forms corresponding to *rousse, sœur, vieille, fraîche, dissoute, favorite, cantatrice, chasseresse, aïeule.*

III.

Translate into French:—

(*a*) She has gone upstairs; she has gone to get her books.
(*b*) It is very warm; if this great heat continues, it will kill the crops.
(*c*) If I had made him study his lessons when he was at school, he would have become a better man.
(*d*) Neither he nor his brother can go away; both must stay.
(*e*) You have told me that my friend has gone; I did not know it, but perhaps you are right.
(*f*) Why were we not told that our friends had gone away?
(*g*) A rich man, it is said, once asked a learned man what was the reason that scientific men were so often seen at the doors of the rich, while the rich were very rarely seen at the doors of the learned. "It is," replied the scholar, "because the man of science knows the value of riches, but the rich man does not always know the value of science."

OUR CERTIFICATE COURSE FOR 1903.

We must again apologise to those of our readers who are studying for 1903 for the large share of space allotted to the course for this year, but they will have the satisfaction of knowing that next month, and for some time to come, all our space will be at their service; and as important work will be begun in the July number, we ask them to advise their friends to order THE PRACTICAL TEACHER at once, and begin the course if they have not already begun.

TEST QUESTIONS ON LAST MONTH'S WORK.

1. What steps would you take to teach children to read "with expression"?
2. Write a summary of the third Act of *Richard the Third.*
3. Trace the settlement of the Normans in the province of Normandy.
4. Write a life of William the Conqueror.
5. What trade is carried on in Waterford, Glasgow, Aberdeen, and Belfast?
6. Give an account of the railways of Ireland.

NOTES AND SYLLABUS FOR JUNE.

THEORY OF TEACHING.

Finish the chapter on the teaching of reading. The modern teacher of reading is expected to do something more than set the children to read and correct their mistakes. He must show them the proper method of breathing; and hence it is necessary to study the physiology of breathing, although technical terms should be avoided in explaining to children the proper way to breathe. The mechanism of the vocal organs should also be carefully studied, as this knowledge will be of great assistance in classifying and dealing with the mistakes made by the children. Phrasing does not receive so much attention as it ought, for it really lies at the root of all expressive reading.

ENGLISH LANGUAGE AND LITERATURE.

Nesfield, chap. vi.

Study *Richard the Third,* Acts IV. and V. This will complete the general view of the play. Next month we shall begin the detailed study of it, and deal with the language and diction; later on we shall discuss the characters and historical accuracy of the play.

Read the second half of *Kenilworth.*

A capital edition of Boswell's *Tour to the Hebrides* has just been published by Messrs. Macmillan. It gives a biographical introduction and useful notes, with a special map to illustrate the route taken, and we cannot recommend a better edition to our readers.

ENGLISH HISTORY.

Read to the end of the Norman period. The important parts are the feudal system and social matters, and also the race question. Students who can read French quickly should read Thierry's *Conquête d'Angleterre,* which is really an exhaustive study of the history of the results of the co-existence of Normans and Saxons in the one island, and is a very valuable book, although the writer attempts to prove rather too much.

GEOGRAPHY.

Study the geography of France, both physical and political, and endeavour to put the two into their proper mutual relation.

LONDON MATRICULATION.

JUNE 1902.

"HELPS" FOR THE LATIN PAPERS.

By C. J. PHILLIPS, M.A., *Stockwell Pupil Teachers' Centre.*

ANSWERS TO MODEL EXAMINATION IN LATIN.

A.

	Singular.	*Plural.*
1. *N. V.*	Vetus poema.	Vetera poemata.
Ac.	Vetus poema.	Vetera poemata.
G.	Veteris poematis.	Veterum poematum.
D.	Veteri poemati	Veteribus (poematibus) poematis.
Abl.	Vetere poemate.	Veteribus (poematibus) poematis.

	Singular.	*Plural.*
N. V.	Audax dea.	Audaces deae.
Ac.	Audacem deam.	Audaces deas.
G.	Audacis deae.	Audacium dearum.
D.	Audaci deae.	Audacibus deabus.
Abl.	Audaci dea.	Audacibus deabus.

	Singular.	*Plural.*
N. V.	Grandius vas.	Grandiora vasa.
Ac.	Grandius vas.	Grandiora vasa.
G.	Grandioris vasis.	Grandiorum vasorum.
D.	Grandiori vasi.	Grandioribus vasis.
Abl.	Grandiore vase.	Grandioribus vasis.

2. Nonagesimus septimus, *or* septimus et nonagesimus. Tricies centum millia quingenta millia. Ante diem decimum Kalendas sextiles, *or* a.d. x. Kal. sext. Annus bissextilis.

3. Nemo omnium Romanorum superest ("None of all the Romans is left").

Nulla civitas unquam talia passa est ("No state has ever suffered such things").

Haud quisquam fugisset nisi nox advenisset ("Not a single person would have escaped had not night come on").

Uter vestrum maior natu est? ("Which of you two is the elder?").

Quidquid est in horto a me satum est ("Whatever there is in the garden was sown by me").

4. *Oblitus* is either the past partic. of the deponent verb *oblivisco, oblivisci, oblitus sum* ("I forget"), or of *oblino, oblinere, oblevi, oblitus* ("I smear over").

Pependere is either the 3rd pers. plural perf. indic. act. of *pendo, pendĕre, pependi, pensum* (transitive), or of *pendeo, pendēre, pependi, pensum* (intransitive) ("I hang").

Abstulistis is 2nd plural perf. indic. act. from *aufero, auferre, abstuli, ablatus* ("I take away").

Saluimus is 1st pers. plural perf. indic. act. from *salio, salire, salui, saltum* ("I spring").

Experrecto is dat. or abl. masc. or neut. sing. from the past partic. of the deponent verb *expergiscor, expergisci, experrectus sum* ("I rise").

Adultum is the supine of *adolesco, adolescere, adolevi, adultum* ("I grow up").

Visit is 3rd sing. pres. or perf. of *viso, visĕre, visi, visum* ("I visit").

Desieris is 2nd sing. perf. subj. or fut. perf. indic. of *desino, desinere, desii, desitum* ("I desist").

B.

1. Ad Siciliam a.d. xiiii. Kal. jun. pervenissemus, nisi iam profecturi Crassum mortuum esse certiores facti essemus.

2. Negavit se intelligere cur tu non eum admonuisses ut domum tecum rediret, dum frater tuus navem solvisset.

3. Quo, quomodo, quare discesserit equidem omnino nescio.

4. Veriti ut tempore adveniret misimus quinquaginta equites ut ei obviam irent.

5. Num quis dubitat quin tu debueris ut tecum Philippos veniret ei persuadere? *or* quin te oportuerit, etc.; *or* quin ei fuerit persuadendum a te, etc.

6. Urbs Veii a Roma haud longe abfuit.

7. Princeps denos sestertios civibus dedit.

8. Mancinus nuntium misit ut (*or* qui) pacem ab Hispanis peteret.

9. Noli loqui tamquam si nos nesciamus quid consilii iniveris.

10. Innocentium nos miseret sed nihil obstabit quin noxios puniamus.

11. Sicarius, tonitru audito, timet ne in se directus sit.

C.

1. (*a*) But, you will say, some old men are peevish, fretful, irritable, and disagreeable. If we ask such questions—yes, and even covetous; but these are faults of character, not of old age. And yet peevishness and those (other) faults which I spoke of have a certain amount of excuse—not that it is a valid one, of course, but such a one as seems able to be admitted. They imagine that they are neglected, looked down on, not taken seriously; and, besides, in a feeble frame, every collision is painful. Yet all these things are rendered milder by a good natural disposition, and also by good education; and this fact can be realised alike in real life and on the stage from those two brothers who are in the (play called) Adelphi.

(*b*) And that remark can be made in the same way about old age; for neither can old age be a light burden in very straitened circumstances—not even to a wise man—nor can it be anything but burdensome to an unwise man, even amidst abundance. In every way the most appropriate weapons for old age are mental acquirements and the practice of the virtues—things which, if cultivated at every stage of existence, produce wonderful fruits, when you have led a long and busy life, not merely because they never fail you, even at the most advanced stage of life—though that certainly is very important—but because the consciousness of a well-spent life and the recollection of many good deeds is most delightful.

(*c*) For what comfort has life? or rather, what trouble has it not? But grant that it has (comfort) by all means; yet assuredly it has either satiety or finality (in its comfort). I say this because I do not care to bewail life as many men, and those learned men too, have often done, nor do I regret that I have lived, since I have spent my life in such a way that I do not feel that I was born in vain, and I go out from life as though I were going from a lodging, not a home; for Nature has granted us (in life) an inn to stay at, not to dwell in. What a glorious day will that be when I set out for that divine company and assembly of spirits, and leave this crowd and rout behind!

2. (*a*) "Caudino proelio." In the year 321 B.C. a Roman army under Postumius and Veturius was enticed into the pass known as the "Caudine Forks" by Pontius, the Samnite general, who then blocked up both ends of the pass, and forced the Romans to surrender and pass under the yoke. The Roman Government refused afterwards to recognise the terms on which their army had capitulated.

(*b*) The Panathenaicus was a speech written in praise of Athens by Isocrates, the great orator. Isocrates died in 338 B.C.

(*c*) Pyrrhus, king of Epirus, was invited into Italy by the inhabitants of Tarentum, who wanted his help against the Romans. He fought against Rome, generally with success, for six years, but was finally defeated by Curius at Beneventum in 274 B.C.

(*d*) This refers to the Pythagoreans. Pythagoras, one of the most famous of the early Greek philosophers, settled, after a life of travel, at Crotona. His followers, who lived a sort of monastic life, spread their settlements and their doctrines over other cities in South Italy. Hence they came to be called the "Italian philosophers."

D.

(*a*) This again was most acceptable and welcome to the troops, as could be seen from the actual expression of approval, that those who had been expecting some well-merited punishment should carry off into the bargain the reward of their discharge.

For when a discussion was set going about the place and the time for that matter (that is, the discharge), they all to a man began to claim by hand and voice from the entrenchments, where they had stood, that they should be discharged at once, and that this could not be firmly settled on the interposition of any pledge if it should be put off to another time.

After the discussion on both sides had taken place in a few words the question was brought to this issue, that those who possessed a home or property in Spain should be discharged at once, the rest at the river Varus. Precautions were taken by Cæsar to prevent any harm being done them, and to prevent any man's being forced to take the oath of military allegiance.

(*b*) But during this delay Metellus suddenly presents himself with his army. The Numidians are got ready, and drawn up by Jugurtha as well as time would admit; then the battle is begun. In that part where the king was present in the battle, the fight went on for a certain time; all the rest of his soldiers were beaten at the first onset and put to flight. The Romans secured a considerable number of standards and arms, but few of the enemy; for in nearly all their battles it is rather their heels than their arms which protect the Numidians.

(*c*) If some god were to take us away from this press of men and carry us to some place in solitude, and there supplying to us abundance of all things which nature craves, yet took away from us altogether the ability to look upon a human being, who would be so iron-hearted that he would be able to bear that life, and that from him the solitude would not take away the realisation of all pleasures?

(These translations err on the side of being too literal, but it is safer in examinations to risk being too literal than to risk the examiner's doubting whether you really understand what the Latin means.)

OUR QUERY COLUMN.

RULES.

1. Each correspondent is restricted to *one* question.
2. Each query must be accompanied by the name and address of the correspondent, and the *coupon* which appears on the back wrapper of the current number of the Journal.
3. CORRESPONDENTS MUST IN ALL CASES STATE THE SOURCE FROM WHICH THEIR QUERY HAS BEEN OBTAINED.

The Editor reserves to himself the right to decline to answer any question which is, in his judgment, unsuited to the Magazine.

Carrett.—You will find the methods of showing the relief of a country fully treated in the article on Map-making, by Miss Reynolds, in THE PRACTICAL TEACHER for last September.

Thomas of Lancaster.—The following subjects for essays might be taken from *Macbeth*:—1. The character of Macbeth. 2. The character of Lady Macbeth. 3. The propriety of introducing the supernatural element into the play. 4. Comparison between *Macbeth* and a drama on the classical model—that is, one in which the three unities are observed. 5. The historical exactitude of the play. 6. Comparison between *Macbeth* and other Shakespearean plays—for example, *Richard III.*

M.M.—If $a + b + c + d = 0$, show that $a^3 + b^3 + c^3 + d^3 + 3(a + b)(b + c)(c + a) = 0$, and $(a + b)(a + c)(a + d) = (b + c)(b + d)(b + a) = (c + d)(c + a)(c + b) = (d + a)(d + b)(d + c)$. (Cambridge Junior.)

Since $a + b + c + d = 0$,

$\therefore a + b + c = -d$.

Cubing both sides of the last equation, we obtain—

$$\{(a + b) + c\}^3 = -d^3.$$

$$\therefore (a + b)^3 + 3(a + b)c(a + b + c) + c^3 = -d^3.$$

$$\therefore a^3 + 3ab(a + b) + b^3 + 3(a + b)c(a + b + c) + c^3 + d^3 = 0.$$

$$\therefore a^3 + b^3 + c^3 + d^3 + 3(a + b)(ab + bc + ca + c^2) = 0.$$

$$\therefore a^3 + b^3 + c^3 + d^3 + 3(a + b)(b + c)(c + a) = 0.$$

Again, since $a + b + c + d = 0$,

$\therefore a + c = -(b + d)$, and $a + d = -(b + c)$.

Also, $b + d = -(c + a)$; $(b + a) = -(c + d)$; $(c + a) = -(d + b)$; $(c + b) = -(d + a)$.

Hence $(a + b)(a + c)(a + d) = \{-(b + d)\}\{-(b + c)\}(b + a)$

$= (b + d)(b + c)(b + a)$

$= (c + d)(c + a)(c + b)$

$= (d + a)(d + b)(d + c)$.

Puzzled (Dundee).—Calculate the resistances of the following two pieces (A and B) of platinum wire:—A is 1·5 metres long and 0·12 millimetre in diameter; B is 1 metre long and 0·24 millimetre in diameter. (*N.B.*—The resistance of 1 cubic centimetre of platinum to conduction between its opposite faces is 0·0000091 ohm.)

(*Arithmetic of Magnetism and Electricity*, by R. Gunn.)

It is found by experiment that the electric resistance of a wire is directly proportional to its length, and inversely proportional to the area of its cross-section. Hence, if R denote the resistance of a wire, l its length, and a the area of its cross-section, we have $R = S\frac{l}{a}$, where S is a constant.

From the data of question we find $R = 0{\cdot}0000091$ ohm when $l = 1$ centimetre and $a = 1$ square centimetre.

$$\therefore 0{\cdot}0000091 = S\frac{1}{1^2}.$$

$$\therefore S = 0{\cdot}0000091 = 9{\cdot}1 \times 10^{-6}.$$

Hence, when l is 150 centimetres and a is $(0{\cdot}012)^2 \times 0{\cdot}7854$ square centimetres, we have—

$$R = 9{\cdot}1 \times 10^{-6} \times \frac{150}{12^2 \times 10^{-6} \times 0{\cdot}7854} \text{ ohms}$$

$$= \frac{9{\cdot}1 \times 150}{12 \times 12 \times {\cdot}7854} \text{ ohms}$$

$$= \frac{910}{96 \times {\cdot}7854} \text{ ohms}$$

$$= \underline{12{\cdot}07 \text{ ohms.}}$$

Similarly, for the second piece of wire,

$$R = 9{\cdot}1 \times 10^{-6} \times \frac{100}{24^2 \times 10^{-6} \times {\cdot}7854} \text{ ohms}$$

$$= \frac{910}{576 \times {\cdot}7854} \text{ ohms}$$

$$= \underline{2{\cdot}01 \text{ ohms.}}$$

A. C. Tansley.—Extract the fifth root of 7 to four places of decimals. (Society of Arts Examination, 1901.)

Assuming that a table of logarithms is *not* provided, the following extension of the process generally used for obtaining the cube root of a number may be adopted:—

1	$5a$	$10a^2$	$10a^3$	$5a^4$
1	50	1000	10000	50000
	54	1216	14864	109456
	58	1448	20656	1920800000
	62	1696	27440000	2122726501
	66	196000	28846643	23347444050000
	700	200949	30288272	23506811344375
	707	205947	31765230000	236667207031250000
	714	210994	31873458875	236891946943423651
	721	21609000	31981871750	
	728	21645775	32090468750000	
	7350	21682575	32105701739093	
	7355	21719400		
	7360	2175625000		
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	73757			

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Ans. 1·4758, nearly.

We regret very much that in the review last month of Jamieson's *Applied Mechanics*, the publisher was given as "Macmillan;" it should have been "Charles Griffin and Co." The same firm are also the publishers of *Sound*, by Poynting and Thomson; *Practical Geology*, by Cole; and *Ore and Stone Mining*, by C. Le Neve Foster, which were reviewed in the same issue.

Micro.—It is somewhat difficult to give a concise reply to your queries, as you do not state for what subject the microscope is required. Different microscopes would be recommended for petrological work and for general biological and botanical work. A geological or petrological microscope is fitted with two Nicol's prisms for working with polarised light, and good work cannot be done without them. These, of course, make the microscope more expensive than it otherwise would be. At the same time, a petrological microscope can be used for bacteriological, biological, and botanical work; but, as a rule, the accessories are not so suitable for these subjects as those of an instrument specially made for the work. A good petrological microscope is Beck's English model petrological microscope, 45A, at £19, 18s. A cheaper but good petrological microscope is Beck's student's petrological microscope, 48A, at £9, 5s. 6d. If the microscope is required for biological work, Beck's Continental model microscope, 51M, at £21, 12s. 6d., is probably as good as can be obtained for about £20. This is a high-class instrument; but a microscope which would meet practically all requirements, and be a better investment than a cheaper instrument, is Watson's Edinburgh student's microscope. This can be purchased without objectives for £8, 15s. If Zeiss's objectives are used with this, it is about the best microscope at the price. We should recommend two objectives—one of low power, about $\frac{2}{3}$ in., by Zeiss, at £1, 10s.; and another of higher power, $\frac{1}{6}$ in., by Zeiss, at £2, 2s. Of course, Zeiss's objectives are admittedly the best purchasable. It is better to get a good instrument at once than to get an inferior one and then have to change it when *good* work has to be done. A good microscope will last a lifetime, and will give less trouble than a cheap one in the way of repairs. The great thing is to get a good stand, as objectives can be purchased singly at any time. Beck's London microscope, which you mention, is, of course, not a high-class instrument, but is probably as good as the price will allow (£5, 12s. 6d. complete); but if a low-priced instrument is wanted, we should recommend Watson's Fram microscope, with one eye-piece and two objectives (Watson's, not Zeiss's), $\frac{2}{3}$ in. and $\frac{1}{6}$ in., at £6, 15s. The stand, without objectives, is £4, and Zeiss's objectives could be used with this. Any of these microscopes, or microscopes and accessories by any other makers, can be obtained from the West London Scientific Apparatus Company, Deodar Road, Putney, London, S.W.

Falstaff.—Four equal rods of negligible mass are smoothly jointed at their extremities to form a rhombus ABCD. To each angular point is attached a spherical particle of mass m, and the framework is lying at rest on a plane when the particle at A is struck by a spherical particle of mass M, which is moving along the plane with a velocity U in the direction AC. Show that, if the whole system be inelastic, the velocity u with which C is set in motion is given by

$$u\{4m + M(1 + 2\sin^2 a)\} = MU\cos 2a.$$

(Cambridge Scholarship.)

Let the angle DAC = ϕ. Let x be the distance of the centre of gravity of the rhombus from a fixed point O in the line CA produced.

Then $OA = x - 2a\cos\phi$, where a is a side of the rhombus.

As the freely-jointed rhombus possesses two degrees of freedom in the subsequent motion—that is, there is rotation of each rod with angular speed $\dot{\phi}$, as well as translation of the centre of gravity—it is convenient to use Lagrange's equations as applicable to impulses.

Let T = kinetic energy just after impulse of the four particles attached to the rhombus.

$$\therefore T = 2m\dot{x}^2 + m[(2a\sin\phi\,.\,\dot{\phi})^2 + (2a\cos\phi\,.\,\dot{\phi})^2],$$

where the first term on the right is the kinetic energy of translation of the whole mass, $4m$, supposed collected at the centre of gravity of the rhombus, and the rest is the kinetic energy of the motion relatively to the centre of gravity.

Simplifying, we have—

$$T = 2m\dot{x}^2 + 4ma^2\dot{\phi}^2.$$

Let J be the magnitude of the impulse between M and the joint A, and let δW be the virtual work of the impulse.

$$\therefore \delta W = J(\delta x + 2a\sin\phi\,.\,\delta\phi) = X\delta x + \Phi\delta\phi, \text{ say.}$$

Lagrange's equations are—

$$\frac{\partial T}{\partial \dot{x}} = X, \quad \frac{\partial T}{\partial \dot{\phi}} = \Phi.$$

$$\therefore 4m\dot{x} = J. \quad \therefore 8ma^2\dot{\phi} = 2a\sin\phi\,.\,J.$$

From the impulsive reaction on M we have—

$$M(U - \dot{x} - 2a\sin\phi\,.\,\dot{\phi}) = J.$$

We have also the kinematical relation—

$$u = \dot{x} - 2a\sin\phi\,.\,\dot{\phi}.$$

It remains to eliminate J, $\dot{\phi}$, and $\dot{x}$ from the above three dynamical equations and the kinematical relation. Thus—

$$4mu = J - 2\sin^2\phi\,.\,J;$$

$$M\left(U - \frac{2J}{4m} + u\right) = J.$$

$$\therefore J(\tfrac{1}{2} - 2\sin^2\phi) = 4mu; \quad \therefore J = \frac{4mu}{\cos 2\phi};$$

$$\therefore M\left(U - \frac{2u}{\cos 2\phi} + u\right) = \frac{4mu}{\cos 2\phi};$$

$$\therefore M(U\cos 2\phi - 2u + u\cos 2\phi) = 4mu;$$

$$\therefore 4mu + 2Mu - Mu\cos 2\phi = MU\cos 2\phi;$$

$$\therefore u\{4m + M(2 - \cos 2\phi)\} = MU\cos 2\phi;$$

$$\therefore u\{4m + M(1 + 2\sin^2\phi)\} = MU\cos 2\phi.$$

[The angle a in question is not defined, but it evidently represents the angle we have denoted by ϕ—that is, half the angle A of the rhombus ABCD.]

Arum.—Prove that the length of the cissoid $(a - x)y^2 = x^3$, measured from the origin to the point where $x = \frac{3}{4}a$, is

$$a(\sqrt{6} - 2) + a\sqrt{3}\log\frac{2 + \sqrt{3}}{\sqrt{2} + 1}.$$

(London B.Sc. Examination.)

$$y = x^{\frac{3}{2}}(a - x)^{-\frac{1}{2}}.$$

$$\therefore \frac{dy}{dx} = \tfrac{3}{2}(a - x)^{-\frac{1}{2}}\,.\,x^{\frac{1}{2}} + \tfrac{1}{2}x^{\frac{3}{2}}(a - x)^{-\frac{3}{2}}$$

$$= \tfrac{1}{2}x^{\frac{1}{2}}\left\{\frac{3}{(a - x)^{\frac{1}{2}}} + \frac{x}{(a - x)^{\frac{3}{2}}}\right\}$$

$$= \frac{x^{\frac{1}{2}}}{2}\left\{\frac{3(a - x) + x}{(a - x)^{\frac{3}{2}}}\right\}$$

$$= \frac{x^{\frac{1}{2}}}{2}\,.\,\frac{3a - 2x}{(a - x)^{\frac{3}{2}}}.$$

Hence $1 + \left(\frac{dy}{dx}\right)^2 = 1 + \frac{x}{4}\,.\,\frac{(3a - 2x)^2}{(a - x)^2}$

$$= \frac{4(a - x)^3 + x(3a - 2x)^2}{4(a - x)^3}$$

$$= \frac{4a^3 - 12a^2x + 12ax^2 - 4x^3 + 9a^2x - 12ax^2 + 4x^3}{4(a - x)^3}$$

$$= \frac{a^2(4a - 3x)}{4(a - x)^3}.$$

Now, if s denote the length of the curve between the given limits, we have—

$$s = \int_0^{\frac{2a}{3}}\sqrt{1 + \left(\frac{dy}{dx}\right)^2}\,.\,dx = \frac{a}{2}\int_0^{\frac{2a}{3}}\frac{(4a - 3x)^{\frac{1}{2}}}{(a - x)^{\frac{3}{2}}}\,.\,dx.$$

Let $z^2 = \frac{4a - 3x}{a - x}$.

Then $\frac{a}{a - x} = z^2 - 3$; whence $\frac{dx}{a - x} = \frac{2z\,dz}{z^2 - 3}$.

Also, when $x = 0$, $z = 2$; and when $x = \frac{2}{3}a$, $z = \sqrt{6}$.

We have therefore—

$$s = \frac{a}{2}\int_0^{\frac{2}{3}a}\left(\frac{4a - 3x}{a - x}\right)^{\frac{1}{2}}\,.\,\frac{dx}{a - x} = a\int_2^{\sqrt{6}}\frac{z^2\,dz}{z^2 - 3}.$$

$$\therefore s = a\left[z + \frac{\sqrt{3}}{2}\log\frac{z - \sqrt{3}}{z + \sqrt{3}}\right]_2^{\sqrt{6}}$$

$$= a(\sqrt{6} - 2) + a\sqrt{3}\log\left[\frac{\sqrt{6} - \sqrt{3}}{\sqrt{6} + \sqrt{3}}\,\Big/\,\frac{2 - \sqrt{3}}{2 + \sqrt{3}}\right]^{\frac{1}{2}}$$

$$= a(\sqrt{6} - 2) + a\sqrt{3}\log\left(\frac{3 - 2\sqrt{2}}{7 - 4\sqrt{3}}\right)^{\frac{1}{2}}$$

$$= a(\sqrt{6} - 2) + a\sqrt{3}\log\frac{2 + \sqrt{3}}{\sqrt{2} + 1}.$$

Puzzled (C.H.E. Exam.).—(*a*) Find the (2*n*)th term and the sum of 2*n* terms of the series $1 - \frac{3}{5} + \frac{9}{25} - \ldots$

This is a geometric series whose common ratio (R) $= -\frac{3}{5}$, and whose first term (A) = 1.

The Nth term of a geometric series is AR^{N-1}. Hence the (2*n*)th term of the given series is $1\left(-\frac{3}{5}\right)^{2n-1}$; and since (2*n* − 1) must be odd, this is equal to $-\left(\frac{3}{5}\right)^{2n-1}$.

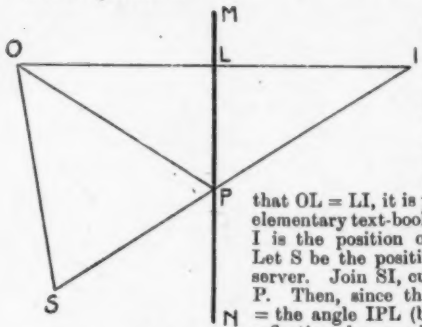
Again, the sum of N terms of a geometric series is—

$$S = A\frac{1 - R^N}{1 - R}.$$

Therefore the sum of (2*n*) terms of the given series is—

$$S = 1\,\frac{1 - \left(-\frac{3}{5}\right)^{2n-1}}{1 - \left(-\frac{3}{5}\right)} = \frac{1 + \left(\frac{3}{5}\right)^{2n-1}}{1 + \frac{3}{5}} = \frac{1 + (0{\cdot}6)^{2n-1}}{1{\cdot}6}.$$

(*b*) Prove, by geometry, that the image of an object formed by a plane mirror is farther from the observer than is the object itself.



Let MN represent the mirror, and O the object. Then, if OL is drawn perpendicular to MN, and produced to I such that OL = LI, it is proved in any elementary text-book on light that I is the position of the image. Let S be the position of the observer. Join SI, cutting MN in P. Then, since the angle OPL = the angle IPL (by the law of reflection by a plane mirror), ∴ OP = IP (Euclid I. 26). Hence SI = SP + PO. But SP + PO is > SO. ∴ SI is > SO.

Caliga.—There is a series of numbers, 1, 2, 3, 5, 8, 13, 21, etc., in which each number (after the second) is the sum of the two that go before it. If u_n stands for the *n*th number, show that

$$2^n u_n = n + 1 + \frac{(n+1)n(n-1)}{1.2.3} \times 5 + \frac{(n+1)n(n-1)(n-2)(n-3)}{1.2.3.4.5} \times 25 + \ldots$$

Verify the result when $u = 11$.

(S.K. Mathematics, Honours, Part I., 1900.)

Let $S = 1 + 2x + 3x^2 + 5x^3 + 8x^4 + 13x^5 + 21x^6 + \ldots$ *ad. inf.*

$$px\mathrm{S} = px + 2px^2 + 3px^3 + 5px^4 + 8px^5 + 13px^6 + \ldots$$

$$qx^2\mathrm{S} = qx^2 + 2qx^3 + 3qx^4 + 5qx^5 + 8qx^6 + \ldots$$

$$1 + px + qx^2 = 1 + (2 + p)x.$$

If $3 + 2p + q = 0$, $5 + 3p + 2q = 0$, etc.,

$\therefore p = -1$, and $q = -1$.

And these values of p and q satisfy the equations—

$$8 + 5p + 3q = 0,$$
$$13 + 8p + 5q = 0, \text{ etc., etc.}$$

Hence the generating function of the series is—

$$\frac{1+x}{1-x-x^2} = \frac{1+x}{\left(\frac{\sqrt{5}-1}{2} - x\right)\left(\frac{\sqrt{5}+1}{2} + x\right)}$$

$$= \frac{\frac{\sqrt{5}+1}{2\sqrt{5}}}{\frac{\sqrt{5}-1}{2} - x} - \frac{\frac{\sqrt{5}-1}{2\sqrt{5}}}{\frac{\sqrt{5}+1}{2} + x}$$

$$= \frac{\sqrt{5}+1}{2\sqrt{5}} \cdot \frac{2}{\sqrt{5}-1}\left(1 - \frac{2}{\sqrt{5}-1}x\right)^{-1}$$
$$- \frac{\sqrt{5}-1}{2\sqrt{5}} \cdot \frac{2}{\sqrt{5}+1}\left(1 + \frac{2}{\sqrt{5}+1}x\right)^{-1}$$
$$= \frac{(\sqrt{5}+1)^2}{4\sqrt{5}}\left\{1 - \frac{2(\sqrt{5}+1)}{4}x\right\}^{-1}$$
$$- \frac{(\sqrt{5}-1)^2}{4\sqrt{5}}\left\{1 + \frac{2(\sqrt{5}-1)}{4}x\right\}^{-1}$$
$$= \frac{1}{\sqrt{5}}\left(\frac{\sqrt{5}+1}{2}\right)^2\left(1 - \frac{\sqrt{5}+1}{2}x\right)^{-1}$$
$$- \frac{1}{\sqrt{5}}\left(\frac{\sqrt{5}-1}{2}\right)^2\left(1 + \frac{\sqrt{5}-1}{2}x\right)^{-1}$$
$$= \frac{1}{\sqrt{5}}\left[\left(\frac{\sqrt{5}+1}{2}\right)^2\left\{1 + \frac{\sqrt{5}+1}{2}x + \left(\frac{\sqrt{5}+1}{2}\right)^2x^2 + \ldots\right\}\right.$$
$$\left. - \left(\frac{\sqrt{5}-1}{2}\right)^2\left\{1 - \frac{\sqrt{5}-1}{2}x + \left(\frac{\sqrt{5}-1}{2}\right)^2x^2 - \ldots\right\}\right].$$

Therefore the *n*th term of the series 1 + 2 + 3 + 5 + 8 + 13 + 21 + . . . is the coefficient of x^{n-1} in the last expression; that is, the *n*th term of the series is equal to—

$$\frac{1}{\sqrt{5}}\left\{\left(\frac{\sqrt{5}+1}{2}\right)^2\left(\frac{\sqrt{5}+1}{2}\right)^{n-1} - \left(\frac{\sqrt{5}-1}{2}\right)^2(-1)^{n-1}\left(\frac{\sqrt{5}-1}{2}\right)^{n-1}\right\}$$
$$= \frac{1}{\sqrt{5}}\left\{\left(\frac{1+\sqrt{5}}{2}\right)^{n+1} - \left(\frac{1-\sqrt{5}}{2}\right)^{n+1}\right\}$$
$$= \frac{1}{2^{n+1}} \cdot \frac{1}{\sqrt{5}}\left[1 + (n-1)\sqrt{5} + \frac{(n+1)n}{1.2}(\sqrt{5})^2 + \ldots - \{1 - (n+1)\sqrt{5} + \frac{(n+1)n}{1.2}(\sqrt{5})^2 - \ldots\}\right]$$
$$= \frac{1}{2^{n+1}} \cdot \frac{1}{\sqrt{5}}2\left\{(n+1)\sqrt{5} + \frac{(n+1)n(-1)}{1.2.3}(\sqrt{5})^3 + \ldots\right\}$$
$$= \frac{1}{2^n}\left\{n + 1 + \frac{(n+1)n(n-1)}{1.2.3} \times 5 + \frac{(n+1)n(n-1)(n-2)(n-3)}{1.2.3.4.5} \times 25 + \ldots\right\}.$$

$$2^n u_n = n + 1 + \frac{(n+1)n(n-1)}{1.2.3} \times 5 + \frac{(n+1)(n)(n-1)(n-2)(n-3)}{1.2.3.4.5} \times 125 + \ldots \qquad Q.E.D.$$

$$\therefore 2^{11}u_{11} = 11 + 1 + \frac{12.11.10}{1.2.3} \times 5 + \frac{12.11.10.9.8}{1.2.3.4.5} \times 25 + \frac{12.11.10.9.8.7.6}{1.2.3.4.5.6.7} \times 125 + \frac{12.11.10.9.8.7.6.5.4}{1.2.3.4.5.6.7.8.9} \times 625 + \frac{12.11.10.9.8.7.6.5.4.3.2}{1.2.3.4.5.6.7.8.9.10.11} \times 3125.$$

$$\therefore 2^{11}u_{11} = 12 + 1100 + 19800 + 99000 + 137500 + 37500.$$

$$\therefore u_{11} = 294912 \div 2048 = \underline{144}. \qquad Q.E.D.$$

R.P.—A river is fed by two tributaries. If the main river flows 2½ miles per hour when the tributaries are flowing 5 and 6 miles per hour at places where their cross-sections are respectively 30 square feet and 20 square feet, find the area of the cross-section of the main river at the point of observation. Also, if in a flood each tributary doubles its cross-section, and the speeds increase to 6 and 7 miles per hour respectively, find the proportional increase of cross-section of the main river when it is running at 4 miles per hour. (Durham University.)

Let A denote area, in square feet, of cross-section of the main river at the first observation. Then the volume of water which flows past the point of observation in one hour is equal to A × 2½ × 1760 × 3 cubic feet. And this is equal to the volume supplied by the tributaries in one hour—that is, equal to (30 × 5 × 1760 × 3 + 20 × 6 × 1760 × 3) cubic feet. ∴ 2½ × 3 × 1760A = 3 × 1760 (150 + 120).

∴ 5A = 540. ∴ A = <u>108 square feet.</u>

Again, let A_1 be the area of cross-section of main river at the second observation. Then we have—

$$4 \times 1760 \times 3A_1 = 1760 \times 3\{2 \times 30 \times 6 + 2 \times 20 \times 7\}.$$

$\therefore 4A_1 = 360 + 280$. $\therefore A_1 = 160$ square feet.

Hence the *increase* of cross-section of the main river is

$A_1 - A = 160 - 108 = 52$ square feet.

And the ratio of this increase to the first cross-sectional area is as 52 : 108—that is, as <u>13 : 27.</u>

Solutions may be had by post to queries sent in by *Arum, E. Storey, Puzzled, Bike (2), Cymry, Tr. Col., Scamp.*

OUR SCIENCE SECTION

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PHYSIOGRAPHY.

(ADVANCED AND HONOURS.)

Coral Reefs.—At a recent meeting of the Royal Society of Edinburgh, Professor Alexander Agassiz gave an account of explorations of coral reefs in the Maldives and other coral reef regions of the world. He said that for twenty-five years he had devoted a great part of his time to the study of coral reefs, and during the last fifteen years he had explored different parts of the Pacific, Atlantic, and Indian Oceans, with the view of coming to some definite conclusion as to the mode of growth of corals, and especially of the formation of those remarkable circular reefs known as atolls. The latter existed principally in the Pacific Ocean, some parts of the Indian Ocean, and, to a limited extent, in the West Indies. He explained that Darwin's subsidence theory of their formation had held practically undisputed sway until about 1876, when doubts began to be cast on its accuracy. Professor Agassiz gave an account of his own explorations, which led him to the conclusion that reefs were due not to subsidence, but to submarine erosion on a more or less extensive scale. Sir John Murray said that Professor Agassiz's theory was a magnificent tribute to the inductive method. He accepted all the general conclusions of the professor, and declared that the death-blow had been given to the Darwinian theory of coral reefs.

The Earth's Age.—One of the ways of calculating the age of the earth, to which reference has previously been made in this place, is that adopted by Professor Joly, of computing how long a time must have elapsed for the sea, which was at first fresh, to have become charged with all the salt it now contains. Guided by the amount of salt which, according to Sir John Murray, the sea contains, Professor Joly concluded that the earth was from eighty to ninety millions of years old. Dr. Dubois has reported on this matter to the Academy of Sciences at Amsterdam, and is led to dispute Sir John Murray's estimate of the amount of sodium carried to the sea by rivers, the outcome of his explanation being to reduce the age of the oceans of the world to about twenty-four million years. This agrees fairly well with Professor Sollas's calculation that the deposition of the geological strata, which began as soon as there were sea and land, has taken some twenty-six million years. Professor George Darwin will not accept less than fifty-six million since the earth threw off the moon, and she had begun revolving on her own axis long before this.

The Atmosphere.—Gautier recently found, after laborious investigation, that hydrocarbons are present in the atmosphere in varying amount, whilst hydrogen occurs to the extent of 20 parts in 100,000, this amount being constant, no matter whether the air is taken from Paris or the Pyrenees. Professor Rayleigh doubts whether this hydrogen was not introduced as an impurity during the course of Professor Gautier's experiments. To solve this question, Professor Dewar endeavoured at a recent lecture to separate the condensable portion of air from the incondensable by employing a liquefying apparatus in which the solution of hydrogen in the liquid was prevented; and by using a glass float in the liquefying vessel, he succeeded in constructing a device which liquefied the nitrogen and argon of the air, but collected the hydrogen and helium unliquefied. Through this he could pass 100 litres of air in fifteen or twenty minutes, whereas Gautier required twenty-four hours. The incondensable residue thus obtained amounted to from $\frac{1}{23000}$th to $\frac{1}{25000}$th of the total, an amount much smaller than that found by Gautier.

The Upper Atmosphere.—Professor Dewar spoke next of the upper layers of the atmosphere. The constituents, up to a height of about nine miles, had been ascertained to be present in practically the same proportion as at sea-level; but theory showed that there must be a continuous variation in those constituents at greater height. Thus, at eighteen miles the carbon dioxide should disappear, while at thirty-seven the oxygen, and at sixty-two the nitrogen, should be gone. Hence it was not to be expected that much change should be detected in the samples hitherto brought down by balloons; but he believed it would be possible in the future to get samples by means of balloons from heights of twenty miles.

An Interplanetary Atmosphere?—Whether there was an interplanetary atmosphere, or whether our atmosphere was absolutely limited to a height of some fifty miles, was a disputed point. One school held that interplanetary space had no gas and no temperature; another, that it had a temperature of something like – 120° C.

Pumice at the Bottom of the Sea.—The fact of particles of pumice-stone lying in abundance on parts of the ocean-bed has long been known, and a French scientist has recently been investigating their origin. He has found that even the smallest particles of pumice which would sink naturally in fresh water, after floating freely for two or three days, would take an almost indefinite period before sinking in salt water. He has therefore come to the conclusion—and the view is borne out by our independent knowledge of the sea-bed in the regions where the pumice deposit is commonest—that this submarine pumice has its origin in volcanic action at the bottom of the sea, and does not come from the atmosphere at all.

The Planet Victoria?—Professor George Forbes, an Irish astronomer, is now engaged in making a series of observations, with a view to discovering whether there exists, outside the boundary of our solar system as we at present know it, another planet as yet unknown and unseen. So convinced is Professor Forbes of the existence of a new planet further from the sun than Neptune, that he has actually given it the name of Victoria. He thinks that the new planet will be at least ten thousand million miles from the sun. It will be remembered that Neptune, the last of the planets to be discovered, is distant one thousand million miles from our luminary.

Signals from Mars.—In the *Proceedings of the American Philosophical Society* for December last, Mr. Percival Lowell refers at some length to the observation that led to the announcement in the press that Mars had been signalling to the earth on a night in December 1900. A close study of the surface-markings of Mars led Messrs. Lowell and Douglas to the result that certain projections observed in December 1900 were not due to such permanent surface-markings as mountains, but were the effect of clouds floating in the planet's atmosphere. At the opposition of 1894 more than four hundred projections were seen in the course of nine months, and since that time other observations have helped to show that the non appearance of these projections at such favourable times, when, if they were mountains, they should have been seen, has proved their non-permanent character. In fact, permanences like mountains were found to do violence to the observations, and the alternative explanation chosen was something floating in the planet's atmosphere and capable of reflecting light, or, in other words, clouds. Mr. Lowell says, further, that the surface-marking, Icarium Mare, is undoubtedly a great tract of vegetation, and the observation of December is completely explained if it be assumed that a cloud was formed over this region and rose to a height of thirteen miles, and then, travelling east by north at about twenty-five miles an hour, passed over the desert of Acria, and there was dissipated after an existence of three or four days. The Flagstaff observations thus tell us that mountains in Mars, if there are any, have still to be discovered.

CHEMISTRY.

(ADVANCED AND HONOURS.)

BY T. CARTWRIGHT, B.A., B.SC.

Oxygen from Sodium Peroxide.—In the course of a lecture on the "Oxygen Group of Elements," Professor Dewar referred to the use of oxygen in a convenient form to supply the place of fresh air in the submarine boat. The best suggestion, he said, is one recently made and probably used in France—the use of peroxide of sodium, which gave off a large quantity of oxygen to supply the place of that which had been breathed, and at the same time absorbed the carbon dioxide given out in respiration. In this latter respect it was superior to liquid oxygen, which would not take up the carbon dioxide. It was also more manageable. By the employment of the peroxide, the air in a submerged boat might be kept comparatively fresh for a considerable time. We (*Invention*) confess we do not see how the peroxide can be made to part with its oxygen quickly enough for any useful purpose without the addition of acid, and in that case the residue would not take up the carbon dioxide.

Platinum.—The New South Wales platinum is obtained chiefly from the Fifield district, about 322 miles west of Sydney, where it is found associated with gold as fairly coarse water-worn grains in the cavities of the bed rock and the wash dirt for a few inches above it. The largest nugget of platinum hitherto found weighs 27 dwt., and is now in the Sydney Geological Museum, where there are two other nuggets, weighing 11 dwt. and 8 dwt. respectively. Platinum has also been found in the Broken Hill district, and in many other places.

Solid Carbon Dioxide.—Professor R. W. Wood says: "It may, perhaps, be a matter of some interest to teachers, whose laboratory facilities are limited, to know that solid carbon dioxide can be obtained from the sparklets now sold everywhere for a few pence for the aëration of beverages. The larger of the two sizes gives the best result. It is best to cool the sparklet in ice and salt for a few minutes before making the experiment, and doubtless the amount of solid obtained would be still further increased by chilling the metal reservoir with which the bottles are filled. A small square of black velvet should be held, or tied with a turn or two of string, over the end of the tube which delivers the gas into the fluid. The nap of the cloth should be on the inside, and the part over the tube should form a little bag about the size of a marble. On discharging the sparklet and quickly removing the bag, the interior will be found to be lined with the snow-white solid, with which a small drop of mercury can be easily frozen. The substance shows off most beautifully on the jet-black surface of the velvet."

Classification of Neon, Argon, Krypton, and Xenon.—Mr. H. Wilde has found that the position of argon amongst the elements comes near to nitrogen in the series $H \times 7n$, with an atomic weight of 21. The elements recently discovered—neon, krypton, and xenon—entirely confirm the position and the atomic weight of argon in this table; and the most recent determinations of the densities of these new gases by Ramsay and Travers show that they belong to the series $H \times 7n$. The gaseous members of the series $H \times 7n$ are arranged in the following order: Ne, 7; N, 14; Ar, 21; Kr, 42; Xe, 63.

Aluminate of Barium.—Aluminate of barium is formed by the action of heavy spar on bauxite, and is said to be an admirable agent for the purification of feed water. It is readily soluble, but when added to water containing either sulphates or carbonates of lime, double decomposition takes place, an insoluble aluminate of calcium being produced, together with insoluble sulphate or carbonate of barium. The precipitate, which is flocculent, settles rapidly, and takes down with it at the same time any organic impurities suspended in the water. The compound is used for feed water softening in France and Belgium.

Extraction of Silver.—Sodium hyposulphite is the reagent used in the Patena process for the extraction of silver. A further modification of this process, known as the Russel process, after the name of its originator, consists in the treatment of the ore with a solution of cuprous hyposulphite in a solution of sodium hyposulphite. The efficiency of the process is due to the rapid decomposition of the silver sulphides by the cuprous hyposulphite. The operation is briefly as follows:—(1) the silver ore is roasted with salt to convert the metal into chloride; (2) the ore is treated with the solutions of cuprous and sodium hyposulphites, whereby the chloride of silver is dissolved and any remaining sulphide of silver is decomposed; (3) the silver is precipitated by sodium sulphide. The sodium hyposulphite is regenerated and used again, but not so the copper solution. The process is only available for silver ores, as it does not pretend to extract high gold values, although some of the gold may be extracted.

Phosphorescence.—Mourets finds that the best mixture to use for the production of this phenomenon is as follows: barium or strontium sulphate, sulphur, and carbonates of barium, strontium, and calcium. To this, before heating, should be added small proportions of sodium carbonate, common salt, or bismuthous nitrate. The mixture should be maintained at a cherry-red heat for some time.

A New Silicon Hydride (Si_2H_6).—During the solidification of the condensation products resulting from the action of dilute hydrochloric acid on magnesium silicide by means of liquid air, MM. Moissan and Smiles obtained a mixture which, after fractionation, yields a gas and a liquid body, the latter being spontaneously inflammable in air. The gas is now under consideration. The liquid compound contains for one molecule of silicon a molecule and a half of hydrogen. To this they attribute the formula Si_2H_6 by analogy with ethane gas, and they hope to be able to verify this theory, and to establish the vapour density of this new compound.

Action of H_2O_2 on ZnO.—M. de Fourand's researches on the oxidation of zinc oxide by means of H_2O_2 lead him to the following results:—1. There exists no oxide of zinc intermediate between ZnO and Zn_2O_3. 2. There exist three different degrees of peroxidation of zinc—Zn_3O_5, Zn_4O_7, and ZnO_2; the first is stable at 100°, the last is extremely unstable even in the cold. 3. These bodies are all hydrated, and permanently retain at least as many molecules of water as atoms of oxygen in excess, in such a manner that they may just as well be considered as compounds of hydrogen peroxide and the protoxide as hydrated peroxides.

New Way of Preparing Oxygen (George F. Janbert).—The peroxides of sodium and potassium are very rich in active oxygen—that is, oxygen which can be easily evolved in the gaseous state. Sodium peroxide contains 20·5 per cent., potassium 33·8 per cent. of such oxygen. The author endeavours to utilise these bodies for the industrial preparation of oxygen, and to facilitate its change into the latent state in a solid body susceptible of giving it up in the cold under the simple action of water. The sodium peroxide is made into blocks by simple compression after being mixed with the theoretical quantity of a soluble permanganate (Na, K or Ca), or of a hypochlorate, the latter body facilitating the decomposition of the hydrate of sodium peroxide, which forms under the action of water, and is stable in the cold. The oxygen obtained by such a method is interesting from several points of view, chiefly on account of the ease of formation—an apparatus of the nature of Kipp's sufficing to prepare thousands of litres—and also on account of the absolute purity of the oxygen prepared.

ELECTRICITY AND MAGNETISM.

ADVANCED AND HONOURS STAGES.

BY EDWIN EDSER, A.R.C.S., F.PH.S.

In the recent examination in electricity and magnetism, alternative questions were, for the first time, set on technical electricity. It should be remarked that the section on technical electricity was alternative with voltaic electricity, and students were required to answer three questions in either of these sections, but were not permitted to answer questions in both sections. Answers to the questions in technical electricity will now be given.

Technical Electricity.

1. Fully answered in Practical Teacher last March.

2. Explain the advantages of the three-wire system of distribution for lighting purposes. (25 marks.)

In a system of distribution for lighting purposes, electrical energy is generated by a dynamo, and distributed, by means of leads, so that it can be utilised in heating the filaments of glow-lamps so as to produce light. A glow-lamp requires a certain current at a certain voltage.

Let C (Fig. 1) be the commutator of a dynamo, connected to the distributing leads AB and DE. When glow-lamps are used, these are connected in parallel across the leads. Let us suppose that the lamps are all grouped near the ends B, E of the leads—the resistance of the leads from A to B, and back from E to D, being r ohms. Let c be the current required for all the lamps. Then the rate at which energy is wasted by the current in the leads is equal to c^2r watts. This waste rapidly increases with an increase of the current c.

The lamps require a definite voltage—let us say V volts—between the terminals of each. Then the voltage between B

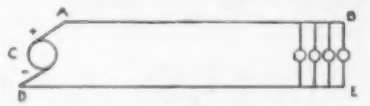

Fig. 1.

and E must be kept equal to V, and the rate at which energy is utilised for the production of light is equal to Vc watts. The object of an economical system of distribution is to keep the rate of waste of energy as low as possible in comparison with the rate of utilisation of energy. This end is gained to a certain extent by making the section of the leads as large as possible, so as to reduce this resistance. But there is an obvious limit to this means of economising; for the interest on the cost price of the copper must not be greater than the cost of the energy saved, otherwise no advantage is gained.

Let us now suppose that the same number of lamps as before are used, but that they are arranged in pairs, each pair being in series between the leads (Fig. 2). Since the current required

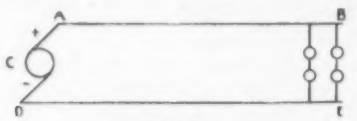

Fig. 2.

for each lamp is the same as before, and the current flowing through one lamp also flows through another, the total current required is half of the previous value—that is, $\frac{c}{2}$. The voltage between B and E must now be equal to 2V, and the rate of utilisation of energy is equal to $2V \times \frac{c}{2} = Vc$ watts—the same value as previously. On the other hand, the rate of waste of energy is equal to $\left(\frac{c}{2}\right)^2 r = \frac{c^2 r}{4}$ watts, which is one-quarter of the previous value. Thus a great saving is effected. The disadvantage is, that one lamp cannot be extinguished without extinguishing the other lamp in series with it.

The three-wire system of distribution has much of the advantage of the system shown in Fig. 2, while each lamp can be extinguished separately. The arrangement is shown diagrammatically in Fig. 3. Two dynamos, C and C′, are connected in

Fig. 3.

series, and three distributing leads are used. The outside leads are respectively connected to the + terminal of C′ and the − terminal of C. The middle lead is connected to the junction between the + terminal of C and the − terminal of C′. The lamps are connected as indicated. When all the lamps are switched on, no current flows along the middle wire; the potential of G is then just equal to that of F. The system is then exactly equivalent to that shown in Fig. 2. If the lamps between G and E are switched off, the dynamo C runs idle, and the whole current flows back along G. As a general rule, the number of lamps switched on in the two circuits is about equal, so that, with the exception of the cost of the middle wire (which may be of small section, since it seldom carries a large current), the system is as economical as running each pair of lamps in series.

3. Describe the Wheatstone bridge method of measuring resistance, and explain how a fault in the insulation of a cable may be located. (25 marks.)

The Wheatstone bridge method is described in every text-book, and need not be dwelt on here. A method of locating a fault in a cable is represented diagrammatically in Fig. 4.

Let AB, CD be two leads stretching between a station at AC and another at BD. It is supposed to be known that there is an "earth" at E, somewhere between C and D. This earth may have a resistance of several miles of cable, and the point E may be at a different potential from the earth, so that a method must be used which eliminates the unknown resistance at E, and is not affected by earth currents.

Join BD by a conductor of negligible resistance, and join AC by two adjustable resistances (R_1, R_2) in series, and also by a

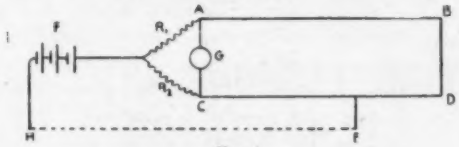

Fig. 4.

sensitive galvanometer G. Join the junction between R_1 and R_2 to one terminal of a battery F, the other terminal of the latter being joined to earth at H. Then the arrangement made is equivalent to a Wheatstone bridge, the arms of which are respectively equal to R_1, R_2, ABDECE. When R_1 and R_2 are adjusted, so that closing the battery circuit, and then closing the galvanometer circuit, produces no deflection in the galvanometer, we have—

$$\frac{R_1}{R_2} = \frac{\text{Length (AB + DE)}}{\text{Length CE}}. \quad \therefore \frac{R_1 + R_2}{R_2} = \frac{\text{Length (AB + DC)}}{\text{Length CE}}.$$

The length (AB + DC) being known, the length CE is determined.

4. Give a general account of the chemical changes which occur in a storage cell during charge and discharge. (25 marks.)

The negative plate of a discharged storage cell consists of an intimate mixture of PbO and $PbSO_4$. The positive plate consists of a mixture of PbO with higher oxides of lead. On sending an electric current from the positive to the negative plate, hydrogen is liberated at the negative and oxygen at the positive. The chemical reactions at the negative plate are as follows:—

(1) $PbO + H_2 = Pb + H_2O$. (2) $PbSO_4 + H_2 = Pb + H_2SO_4$.

The oxygen liberated at the positive plate produces higher oxides of lead.

$$PbO + O = PbO_2.$$

The actual chemical constitution of the chocolate-brown substance covering the positive plate after charging is not precisely known. During discharge, the positive plate becomes reduced, while the metallic lead of the negative plate becomes reduced and converted into lead sulphate.

At positive plate

$$PbO_2 + H_2 = PbO + H_2O.$$

At negative plate

(1) $Pb + O = PbO$. (2) $PbO + H_2SO_4 = PbSO_4 + H_2O$.

5. Explain, with a diagram, the potentiometer method of testing the graduation of a voltmeter, reading from 0 to 5 volts.

A long uniform wire BCDE (Fig. 5) is connected in series with

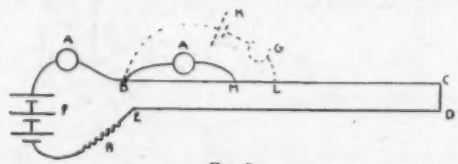

Fig. 5.

an ammeter A, a battery F, of which the E.M.F. exceeds 5 volts, and an adjustable resistance R, used to keep the current (indicated by the ammeter) constant. The positive terminal of a standard Clarke's cell K (E.M.F. = 1·43 volts) is connected to the positive terminal of the battery, and the negative terminal of the Clarke's cell is connected, through a sensitive galvanometer G, with a sliding contact, by means of which contact can be made with any point on the wire BCDE; when, on making contact (at L say), there is no deflection of the galvanometer G, we have, if c is the current flowing along BCDE, and r is the resistance of unit length of the wire BCDE,

$$1{\cdot}43 = cr \times \text{length BL}.$$

If we now join the positive terminal of the voltmeter V to B, and connect the other terminal to a point M on the wire, the true potential difference between B and M will be equal to

$$cr \times \text{length BM} = \frac{\text{Length BM} \times 1{\cdot}43}{\text{Length BL}}.$$

The resistance of the voltmeter is so great that no appreciable difference is produced in the current flowing along BCDE. We have just found the true P.D. between B and M; this must be compared with the reading of the voltmeter. Making contact by turns at different points along BCDE, the graduations of the instrument may be completely tested.

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WE should like to specially direct the attention of our readers to the fact that the Board of Education, in the Syllabuses for the Scholarship and Certificate Examinations 1901 and 1902, requires "no set books" for French and German. Students preparing for these examinations, as well as students for London Matriculation, could not do better than attempt month by month the pieces set for translation here. They are from the best authors, and of varied character. A competitor who does not gain a prize can derive considerable benefit from the exercise. A study of the successful competitor's translation, and of our remarks, will help him to see where he might have done better. If desired, his paper can be returned (fully corrected) by enclosing six stamps together with a stamped and addressed envelope. Corrected papers cannot be posted until after publication of the journal.—ED.

RULES.

1. All translations should be **posted not later than June 9,** and addressed:—*Prize Editor*, Office of THE PRACTICAL TEACHER, 35 and 36 Paternoster Row, London, E.C.
2. Competitors should cut out and send the Coupon which appears on the Back Wrapper page of the current number.
3. Competitors should adopt a pseudonym, and send name and address written on a separate piece of paper.
4. No competitor may take the prize offered more than once in three months.

FRENCH PRIZE COMPETITION.

A Prize of One Guinea will be given for the best translation into English of the following extract:—

Quelquefois la vision d'Hugo devient si intense qu'elle en est hallucinatoire. Il semble que chez lui toutes les autres sensations se transforment en images visuelles. C'est ainsi que, suivant sa propre expression, en de certains instants "l'oreille aura aussi sa vue," et qu'assistant du haut des tours de Notre-Dame, un matin de grande fête, à l'éveil des carillons, le poète verra "s'élever de chaque clocher comme une colonne de bruit, comme une fumée d'harmonie." Dans certains cas son hallucination sera même telle qu'il en viendra, et ses personnages avec lui, à prêter la vie aux choses inanimées; les truands, montant à l'assaut de la cathédrale, aperçoivent en haut des tours, "des guivres qui ont l'air de rire, des gargouilles qu'on croit entendre japper, des salamandres qui soufflent dans le feu, des tarasques qui éternuent dans la fumée;" et la Esméralda, quand elle entre dans la chambre où elle va recevoir la question, voit tous les instruments de torture "se mouvoir et marcher de toutes parts vers elle pour lui grimper le long du corps et la mordre et la pincer." Si Hugo a dû beaucoup pour la réussite de l'œuvre qu'il avait entreprise, à son don de vision intense et d'évocation pittoresque, il n'a pas été moins puissamment aidé par son incomparable talent d'écrivain. Nul n'a disposé pour traduire ses impressions d'un vocabulaire plus riche, ni d'une plus merveilleuse habileté à ciseler ses phrases; nul n'a su comme lui obtenir avec des mots des effets qui semblaient jusque-là réservés aux arts plastiques, et donner à la langue du relief et de l'éclat. FERDINAND BRUNETIERE.

RESULT OF THE FRENCH PRIZE COMPETITION.

The prize is awarded to "Yasmar," the pseudonym of Mr. John Ramsay, 17 King Street, Castle Douglas, N.B.

First Class.—Polly, Gnothi Seauton, Phœnix, Kerboga, Logic, Choufleur, Henry Esmond, Agaznog, La Printanière, L'Anglais, Ephesian, Petitoiseau, Daisy (Aberdeen), Spero, Ouard, Q.U.A.Y., Alcar, Myosotis, Katia, Raimeis, Kettering, Fidessa, Ethik, Baron, Wessex, Undine, Débutant (Norwich), Chemineau, Aiphos, Thames, Aijesbe, La Creevy, Ashdown, Stella Vere, Conor, Forward, Floreat Etona, Hélène, Eralief, Poulton, Kitty, Hundsfott, Glenmark, Map, Josephine, Gwynne, Thrums, Hilaris, Punch, Whymark, Moffat, Helvétie, G.I.R.L., Myrtle, Maisonnette, Elma, René, Tortoise, Mona, Marwenne, Freesia, Louton Vale, Christina, Rosica, Day Dawn, Ateli, Aramjay, Aline, Sertorius, Marianus, Verdant, Eureka, Léonie, Emse, Prêtreterre, Laurence, Alcestis, Altona, Veronica (Southampton), Jungwolfia, Débutante, Ambrosia, Citoyen, Jay, Frost, Louise, Poynton, Lady Monica, Bull-dog, Veronica (Dewsbury), Officium agite, Goggles, Le commençant, Dot, Marguerite, Jane, La poupée, Saxonne, Hasten slowly, Astre, Bea, Cordelia (Richmond), Dif, Mathetes, Onze ans, H.A.D., Personne, Mynwy, May, Aspasia, Pompilia, Mignonette (Hawick), Evelyn, A.P.H., Rina, Penelope, Primrose, Excelsior (Upton), Excelsior (Luton), Sunflower.

Second Class.—Kler, Michael, Rosalind, L'espérance, Agricola, Leumas, Brunswick, Daisy (Oxford), Margaret (Newport), Capuchin, H.M.H., Heather, Wood Sorrel, Echinops, Amy Harstow, Aloz, Eve Effingham, Noel, Brutus, Margaret (West Kilbride), Chaos, Portia, Lorette, Iolanthe, Roma, B.S.B., Mist, H.W., Hague, Glendale, Regner, Ivy, Cordelia (Paisley), Nebu, Pyro, Ylhi, Llanroc, Topsy, Shamrock II., Copperfield, Acacia, Pewybont-ar-Ogwy, Florothy, Mignonette (Glasgow), Rhys Lewis, Penyghent, Doubtful, Pamela, Gracchus, E. E. Bidwell, Buttercup.

Third Class.—Mineag, Excelsior (Taunton), Wales, Loose hair.

Disqualified.—Rule 2: C. Hollyer, Galtee, La Morelle, Fanchon, Primus. *Received too late.*—Gert.

Report.

To translate such an extract as the one set correctly and into idiomatic English was a more difficult task than it appeared to many competitors to be. Almost every one went wrong over the sentence *On verra bien, les autres*..... Most competitors took *les autres* as referring to other nations, but the context gives no support to this rendering. Reading the sentence with what precedes, we see that the author, commencing with France as it is, and referring to its long and prosperous past, does not undertake to prophesy as to its future. Generations yet to come (*les autres*) will be able to tell the tale of France in the future. This is the meaning of the sentence. The successful competitor has gone wrong in this, and his too literal rendering of *faire les frais* is open to exception. *Faire les frais* has a much more extended metaphorical use than its corresponding English equivalent. "Run the risk of making," or "bear the brunt of," would be a better rendering. *Grandeur* was frequently translated "grandeur," and a number did not see that *bon enfant* is used adjectively. The papers of this month produced a somewhat plentiful crop of curious renderings. "I would have a great inclination to call him an eulogium," writes one competitor. We have never tried the effect of applying this term to a person with whom we are arguing, but it might be as effective as "parallelogram." "The inhabitants will also see that I have been abstemious from critics," dimly suggests a new and fearful risk for the long-suffering race to whom reference is made. Two competitors suggest that occasionally a piece should be given for translation into French. We gave such a piece some years ago, and would do it again if we were assured of a greater measure of support than we then obtained.

French Prize Translation.

The history of France is, moreover, a capital study in optimism. Our country has often blundered; she has made many mistakes; she has suffered greatly. Yet, notwithstanding, after the lapse of fifteen centuries she is still to the fore. As regards other countries, more anon; our own, in spite of, nay, in defiance of everything, has survived, and is to-day alive and happy. But she is deteriorating, they say. Strange deterioration, indeed! Courage, industry, and generosity continue to characterise her people; and when great experiments have to be made, it still falls to her lot to bear the burden of expense for the rest of mankind. At times her madcap frolics are such that one would think she enjoyed perpetual youth.

The difficulty of my subject is its magnitude. France is no light theme to undertake. But as it is not at all my aim to pose as a public teacher, I have, in the simplest manner possible, followed the random train of thought suggested by my personal experiences and impressions. I have related just what I saw, what interested me, what amused me. If any one were to find fault with me on the score of incompleteness, I would feel inclined to take the criticism as a compliment. It will be seen, too, that I have been a sparing critic. So much ill has been said of our poor country that I have taken a delight in saying something good of her. Our country has her faults and failings, and these we should labour to correct—each one, of course, beginning with himself. But I do not relish the idea of indulging in bitter reproaches, and thus casting a shadow of gloom over that radiant good-humour and joy of living that mark our sanguine and ingenuous people. YASMAR.

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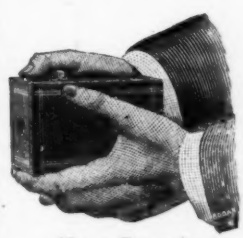

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THE EDITOR'S TABLE

MEMORIES.*

IT is absurd to think of Dr. Kerr as an old man; senility and Dr. Kerr are incompatible ideas to any who have ever known his forceful personality. That he, who was in many respects the youngest and most vigorous member of the inspectorial staff, should be required, by reason of the date of his birth, to retire from active service, seemed the height of absurdity. What would he *do?* Every one knew he must be active, retirement notwithstanding, for activity is essential to a man of his type. Luckily the authorities of Dover House took a commonsense view of things, and his retirement from the supervision of elementary schools may be regarded as only a change of occupation, allowing more leisure for work in secondary schools. For the rest, we have here what we hope is only a first instalment of the fruits of his leisure in another line; for an inspector in active service in Scotland has little time for literary composition, and his books must wait till his reporting has been finished.

The retrospect of forty years here given is not a review of matters educational alone. It might be better described as a review of the schools as they strike an observer of Dr. Kerr's type, to whom codes and regulations are matters of evanescent importance compared with the human elements—the children, the teachers, the managers, and the people of every class with whom his official work bring him into personal relations. This does not imply that codes and their influences were ignored; the writer felt more keenly than most men the blighting effects of mechanical regulations, and exercised a more powerful influence than the casual reader of his book would infer in widening and humanising the departmental views of education, both in schools and in training colleges. Only in one chapter, indeed—that on joint university and normal-school training—does he give the reader the opportunity of judging how important a part he has played in the educational reforms of the last half-century in Scotland. In many other places his friends can read this between the lines.

The book begins on the keynote. Instead of a review of education since the days of John Knox, we are given a few racy reminiscences of college life, including a walking match, in which six miles were covered in 66¾ minutes; and a bout with the gloves, which resulted in the temporary damage to the features of a right reverend ecclesiastic, then, happily, unconsecrated.

In the early days of Government inspection, while all schools in Scotland were denominational and were inspected by officers who confined themselves to schools of a certain denomination, the districts were of enormous extent, and the facilities for travel such as suggest the conditions of work which prevail in some of our newer colonies. To one of Dr. Kerr's physique the simplest means of locomotion was riding on horseback, and we have several incidents related of his peregrinations in this way between Dundee and John o' Groat's—amusing, but beyond our space for quotation. The humours of primitive railway travelling in the far north are also well depicted.

That the humours of school examination in the olden time are also recorded in a genial tone goes without saying. We can all recognise, at least in type, the man who said, "There is no man, Mr. Kerr, whose face I am better pleased to see than yours, but I am always glad to see your back!"

The book is full of good stories, scholastic and other; but it would be a mistake to regard Dr. Kerr as a mere collector of "howlers." How deep and kindly his insight is into educational problems and their solutions is nowhere better seen than in his admirable sketch of James Beattie, a cobbler in an Aberdeenshire village, who devoted the best part of his days to giving the children of his neighbours in humble life the elements of a true education. This sketch had already been given in the pages of *Good Words*, a magazine of noble traditions, in which justice has been done to many a humble worker for humanity otherwise unknown, but we are heartily glad to see it here in more permanent form.

As we have already said, the book is full of good stories—Scotch stories, of course—from which the Sassenach may gather much regarding the state of opinions and morals north of the Grampians, on such varied themes as what constitutes "too much fushing" on the part of a parish dominie, how to preach another man's sermon without being guilty of plagiarism, and the direful consequences of "puttin' too much watter in the whusky," besides stories of the classroom and the examination paper. We do not propose to retail any of those tit-bits here, partly because, in some quarters, the book has been regarded as mainly a book of stories, and we consider that this view is wholly superficial. It is essentially an educational retrospect, taking education in its widest bearings as not merely a matter of schools and codes, but as an element in the wider social life of the country. It is in this aspect that we commend it to the readers of THE PRACTICAL TEACHER, while, at the same time, assuring them that they will not find a chapter, scarcely a page, which is not brimful of genial humour, and that those who are in search of a new after-dinner story, and have some slight acquaintance with the Doric, will not be sent empty away.

* *Memories Grave and Gay: Forty Years of School Inspection.* By John Kerr, LL.D. (William Blackwood and Sons.)

MR. YOXALL'S NEW ROLE.*

MR. YOXALL is also among the novelists; and, indeed, he has many qualifications for the part—a graceful and pleasantly ironic style, a lively wit, a fertile imagination, and a wide knowledge of men and things. He makes his initial appearance in this new arena with a story which moves, as in duty bound, in an atmosphere of teacherdom, and for this reason alone may be considered of interest to our readers. *The Girl from St. Agneta's*, which originally appeared serially in the pages of a contemporary, bears as a sub-title "A Fantasia on a Fugue," a suggestion of interwoven and subtile complexity which is happily not apparent either in the plot or the presentation. The heroine, who rejoices in the somewhat unscholastic pet-name of "Madcap," fascinates the Reverend Principal of St. Agneta's while she is under that gentleman's spiritual and pedagogic tutelage, and the progress of his variegated wooing exercises Mr. Yoxall's pen for some two hundred and fifty very readable pages. The Reverend Godfrey Gore as a lover is not a distinct success, and we should not advise a potential suitor to address the girl of his heart in this fashion: "Let us be equals. There's not so very much disparity between a clergyman and a veterinary surgeon's daughter." The reverend gentleman, after that speech, deserved the repulse that he got; and though, later on, his Sandow-like exploits and his whole-hearted championship of the wronged girl somewhat reinstate him in the reader's favour, he will be generally voted a lucky dog when "Madcap" at length "comes blushingly into the crook of his arm."

The scenes at Caen, where "Madcap" and her chum are attending a holiday school of languages, show Mr. Yoxall at his best; and he is equally on sure ground when he describes his heroine's daily life in the national school at Studley Walton. Alethea Chetwyndham, daughter of the Rector and the Di-Rector of the parish, belongs to the school of the rebellious, and her rivalry with the schoolmistress in the affections of a certain Oxonian socialist with a pipe, leads her to erratic courses which, if not convincing, are at least amusing. Her mysterious disappearance, and the ridiculous charge of murder against "Madcap," are perhaps the weakest things in the book, though they need not be insisted on in the face of much that is bright and full of promise.

If Mr. Yoxall has not written a distinguished book—and probably the circumstances of its composition forbade that—he has written an interesting one, which will certainly encourage his many friends and admirers to look for something of more than ordinary merit from his pen in the near future. When the holidays arrive, our readers will be well advised to put a copy of *The Girl from St. Agneta's* into their portmanteaus. It will interest and amuse, and, if the critical spirit is not unduly in evidence, will pleasantly while away an hour or two on a summer afternoon.

* *The Girl from St. Agneta's: A Fantasia on a Fugue.* By J. H. Yoxall, M.P. (Ralph, Holland, and Co.)

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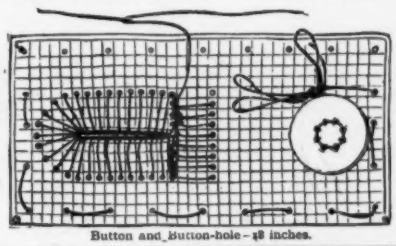

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Intermediate Arithmetic. By William J. Milne, Ph.D., LL.D. Pp. 219. This book is meant to serve both "as a comprehensive elementary book and a thorough preparation for the more rigid work of the author's *Standard Arithmetic*." We doubt whether it will attain any great vogue in England. A teacher in want of some novel hints for oral work might possibly find what he desires here, though he should be warned that the answers to such questions are not given by Dr. Milne, nor are the answers to some of the other questions which cannot easily be worked mentally—as, for instance, to the five hundred questions which, with a novel conciseness, appear on p. 61. The work is distinctly American in character, and an English teacher will need great care in using it. As in other American books, a *billion* is 1,000 millions; 100 lbs., and not 112 lbs., make 1 cwt.; a gallon contains 231 cubic inches, not 277¼; a pint in "dry measure" has not the same volume as a pint in "liquid measure;" and so on. The money questions are, of course, in dollars. In some respects Dr. Milne's work is not merely un-English, but old-fashioned; but, on the whole, it is careful and conscientious. It is beautifully printed and well bound.

AMERICAN SCHOOL AND COLLEGE TEXT-BOOK AGENCY.

The Private Life of the Romans. By Preston and Dodge. (The Student's Series.) A book of handy size, well illustrated, and clearly written; it will save the use of the large *Dictionary of Antiquities*. Great care and accuracy is a very prominent feature; references are given to the passages in the classics from which facts are drawn. An index of the Latin words occurring would very greatly add to the utility of the book, though, even as it stands, the book would greatly aid the reading of such works as Horace and the Roman comedians.

Greek and Roman Mythology. By Harrington and Tolman. (The Student's Series.) A great merit of this book is its handy size; a disappointing feature is the absence of illustration. To the ancients every deity was as easily recognisable in sculpture or in fresco as to moderns are, for instance, St. George or St. Sebastian. The young student of classic literature needs a knowledge of these externals and accessories far more than a philosophic idea of the rise in the belief in gods from the observance of the powers of nature. Besides, it is merely bewildering to find that gods by the score are personified rain-clouds and the like; one is reminded of the blatant atheist who attributes everything from Moses down to William Tell to the "Sun Myth." More satisfactory are the passages culled in illustration from English poets, so excellent as almost to compensate for lack of graphic illustration.

A First Book in Latin. By Tuell and Fowler. (The Student's Series.) Not so completely original as some of the excellent books recently published, but yet it keeps what is best in the old-fashioned plan, and has other good points. The nouns and adjectives come first, but one tense of a verb accompanies each chapter. A grammatical rule is also to be learned with each. The vocabulary is such as to fairly cover most of Cæsar's *Gallic War*, and the exercises are planned with the same author in view, so that the text-book would suit teachers who commence with Cæsar as first Latin author.

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Nature Series: Leaves. By F. H. Shoosmith, B.Sc. Readers of the *Art Monthly* will be familiar with the kind of work Mr. Shoosmith has put together in this little book, as some time ago we gave facsimile illustrations of several "nature-printed leaves." Undoubtedly the process is simple, and very useful, the form and venation of the leaves being so clearly expressed on the paper, and at the same time impressed on the pupil's mind. They afterwards serve excellently as drawing copies.

Drawing Cards, Part V. We have before spoken in terms of high praise of the soft gray-line series of Messrs. Steeley and Trotman. Messrs. Bacon are now issuing coloured sets; and though perhaps the colour in a few examples leaves something to be desired, the forms still remain good, and the character of the lines excellent.

Brushwork and Design. By Frank Steeley. Part II. of the series fulfils the excellent promise of Part I. It includes the curved line and the typical brush stroke utilised to produce both natural forms and conventional designs. Mr. Steeley's name is a guarantee that the "drawing" of these is excellent. The colour printing on Plate I. is the least successful feature of the book. Many useful hints on design are given at the commencement of the book.

The Principles and Practice of Perspective. By J. Carroll. Ever since the present syllabus of perspective has been issued, we have been constantly asked to recommend a good book to meet the new requirements. Mr. Carroll's book will do a great deal towards solving the difficulty. Part II. treats of inclined and oblique planes, with shadows and reflections; and a sufficient number of examples are clearly worked out and explained in each section to enable the student to get a good grasp of the principles. With careful study, no pupil need fear an examination on the lines of last year. The clearness of the working is specially commendable.

GEORGE BELL AND SONS.

Ovid: Tristia. Book I. By A. E. Roberts, M.A. We do not think that it would be possible to present the text of Ovid to a young reader in a more attractive form than this. The print is clear, and the illustrations are both abundant and excellent. There are four appendices—one dealing satisfactorily with "the Roman book," another consisting of a good map of Ovid's route to Tomi, a third which is entirely grammatical, and contains a rather depressingly long list of subjunctive usages illustrated from the text, and a fourth which gives a classification of Ovid's metaphors, similes, etc. We cannot help thinking that this last—though undoubtedly useful for the purposes of examinations—is sure to have a rather deplorable effect on the more intelligent boys and girls who use the book. They will tend to associate Latin poetry simply with "hypallage" and "metonymy," etc.

Here and there in the notes, which are otherwise sound and clear, the editor has explained things which ought, we think, to be platitudes to his readers.

A. AND C. BLACK.

The Rise of Hellas. By E. G. Wilkinson, M.A. (Black's Classical Series.) This is a historical Greek reader. The chapters follow generally chronological order, and the story of Hellas is given as far as the close of the Persian war. The readings advance gradually in difficulty as the story progresses. It is simply and solely a reading book, suited for a class that has mastered the elements of grammar and syntax, but has not yet commenced reading Greek authors. There are full explanatory notes and a copious vocabulary. There are numerous illustrations, and a map which would be better were it clearer. In a map of such a mountainous country the old method of indicating mountains by shading is a bad one; names become quite hidden.

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Virgil's Æneid, Book II. By P. Sandford, M.A. (Blackie's Illustrated Series.) This series now includes a considerable number of books, several of which have been already reviewed in these pages, and we have also been able to give a specimen of their very fine illustrations.

The frontispiece of this volume is a beautiful photograph of that masterpiece of the sculptor's art, the Laocoön, whose tragic story is an episode in this book. Many of the drawings are exact representations of antique sculpture, mural frescoes, painted vases, and the like; and we venture to doubt the expediency of this in books intended for young students. Let the more advanced student go to the original sources of information wherever possible; but these quaintly-drawn archaic figures appeal so quickly to a boy's sense of the humorous, that their purpose is lost. There are some groups of antique arms and treasures from the museums: might not these have been furbished up for the occasion, and made to appear as Virgil depicts them, and not covered with the rust and decay of twenty centuries?

How often one hears the complaint that the gems of classic literature are treated merely as so much grammatical exercise. This series should please both schools of critics, for while the grammatical index and notes are unusually full, there is a very important section dealing very ably with the literary side. Probably nothing is more difficult to a teacher than the development of taste in his pupils. This difficulty some of the leaders of our profession have attacked recently, and in this book Mr. Sandford will help many a teacher to feel and point out the beauties of Virgil's poetry.

The appreciation of Virgil's style as compared with others, and notably with Homer's, the discussion of the question of how far his merits are lessened by the fact of his indebtedness to the Greeks, and the rise of poetry among the Romans, are other points dealt with in detail. The subject of scansion and accent, particularly in relation to the hexameter verse of the *Æneid*, is clearly treated, the English examples being very happily chosen.

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Livy, Book I. By J. Brown, B.A. (Blackie's Illustrated Classics.) In its general outlines this book closely resembles the others of the same series, differing where the nature of the subject calls for a different treatment.

In a book where history is so largely decked out with fable, the introductory chapter—on evidences of early history, on Livy's use of the material to hand, and so forth—is a very necessary part. Roman historians and their Greek models are also discussed. The notes also contain many valuable hints on the history of the period, as well as the usual grammatical notes.

As in the rest of this series, the literary aspect is held to be of great importance, and so a chapter is devoted to the style and language of the author, and to a critical comparison of Livy and his contemporaries with the writers of Cicero's age.

We like the exercises for retranslation. It is good to take translation of an author and composition in his language together; composition is thus more easily mastered, and the vocabulary more surely acquired.

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French Test Papers. By Emile Le François. These papers are designed for Civil Service and university students. The compiler frankly compares examinations to lotteries, and the questions to puzzles. But we cannot see why questions cannot be so framed as to serve the useful, straightforward purpose of testing the candidate's practical ability in the language. In some of these questions the forced, unnatural atmosphere of the intellectual hot-house is the most evident characteristic; but, except for this, we like the papers. The well-chosen extracts for translation, the questions on grammar, idioms, French history and literature should afford good practice for advanced students.

All French Verbs in Twelve Hours. By Alfred J. Wyatt. Here is a little book with an attractive title, which we should like to see realised. The author's object is to reduce mere memorising to a minimum, and a very laudable object it is. But both student and teacher soon learn that one may perfectly understand the structure of the French verb, and yet be as helpless as a baby in applying this knowledge; and *Wissen* is useless without *Können*, which latter cannot be acquired in twelve hours. This systematic little book will be a valuable aid if used in connection with abundant practice in reading and speaking.

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Xenophon: Anabasis I. By G. M. Edwards, M.A. This is a thoroughly sound book. There is a straightforward and scholarly introduction, the text is well divided and clearly printed, and the grammatical notes are lucid and terse. A special point has naturally been made of the geography, and in dealing with this the editor quotes largely from Ainsworth and Professor Ramsay. The vocabulary and the grammatical index are unusually good, and will certainly be very useful to any one who tries to get anything like a detailed conception of Xenophon's style.

Gai Juli Caesaris de Bello Gallico, Liber I. By E. S. Shuckburgh, M.A. This book is apparently an expanded reissue of an earlier one, and perhaps this fact accounts for, though it surely does not justify, the defects which we venture to point out in it.

We have nothing to say against the notes on the whole, nor against the subject-matter of the introduction, though we notice that, on page 53, *domum* is called a locative case; but we do protest against the sort of English that Mr. Shuckburgh writes in many passages in the introduction, and here and there in the notes.

To justify what we have said, we quote three passages which seem to us to be the most striking, though they are not the only, examples of what we cannot help calling carelessness. In the introduction, on page xii we find this: "To Cisalpine Gaul we have seen that the law added Illyricum to Cæsar's government." On page xxv occurs this sentence: "Since the time of Marius all full citizens, *independent* of the amount of their property, could serve in the army, but only citizens." In the notes, on page 50 is a specimen of model translation, meant, apparently, to help a boy through a difficult sentence. This is how the boy is advised to translate: "And it is least frequently to them than to any that merchants come bringing what tends to enervate men's spirits."

These things may be misprints, but we do not think they are. In any case, either Mr. Shuckburgh or the Cambridge University Press is responsible.

Phædrus: The Fables, I. and II. By J. H. Flather, M.A. This should prove a very useful little book for beginners. There are one or two places in the notes where, we think, slight alterations should be made. On page 32, for instance, in the note on *contenderet*, the editor translates *quem commodasset* roughly as, "which (he said) the sheep had borrowed," instead of as, "which (he said) he had lent to the sheep." We certainly think that a young pupil would be considerably mystified by this note as it stands. Another instance is the note on line 5 in the prologue to Book I. On the whole, however, it is a sound little book.

W. AND R. CHAMBERS.

Selections from the Best English Authors. Edited by Professor Murison, M.A., LL.D. This book reminds us strongly of the literary reader brought out by the same publishers several decades ago. It is certainly a great improvement upon the former work in many respects. In the first place, the illustrations greatly enhance the value of the book. It adds materially to the pleasure a scholar derives from the perusal of an extract to get some knowledge of the appearance of the man who wrote it. He associates the face with the production, and takes a keener interest in what he reads. The fifteen illustrations are a credit to the book, and they are well authenticated. One could almost have wished for more of them; but perhaps this would have been selfish, considering the price of the book. Another great improvement on the old literary reader is in the fuller biographical notices, which are placed immediately in front of the selections, and not at the end of the book, as in the older work. These brief biographies have much literary merit, and convey a sufficiency of valuable information. The notes at the end of each selection are copious, and fulfil the proper function in a work devoted to literature.

The writer's choice of extracts deserves much praise, for they are thoroughly typical. It is doubtful whether the earlier selections will prove as interesting to the scholar as the more modern. The style and mode of thought are too far removed from those of their own day for most scholars, and, except in very isolated instances, the extracts from early writers have only a languid interest. From experience we have found that very few have the genuine literary relish which is necessary to enable them to take a serviceable interest in the history of the language. We fancy more youths will enjoy the last extract, from Stevenson's *Kidnapped*, than any amount from Layamon or Ormin. Still, if even a few are tempted into those delightful pastures, the editor's purpose will have been answered.

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A System of Brush Drawing and Design for Public Elementary Schools. By R. Smeaton Douglas and Ada Hill Walker. There are some very good features about this book, and the careful teacher or student will get many valuable suggestions both from the letterpress and the illustrations.

In the introduction the author states that "most books on brush drawing seem to have been written more for the very young pupil who takes the subject up as an amusement than for the more advanced student who desires to devote himself with a serious purpose to this branch of art."

Keeping this in view, he has practically omitted all exercises which would be of service in an ordinary elementary school, and the major part of the book is given up to work more suitable for fairly advanced students—such as should be found in the "advanced section" of higher grade schools, in evening continuation schools, or teachers taking a second course under Article 91 D of the Scotch Code. For these, the proper methods of treating

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J. AND A. CHURCHILL.

A Manual of Botany, Part II. By Professor Reynolds Green, Sc.D., F.R.S., F.L.S. Readers of THE PRACTICAL TEACHER know Professor Green as an enthusiastic, clear-headed botanist whose notes are always acceptable because of their lucidity and newness. It will not surprise them, therefore, to learn that a second edition of the professor's *Manual of Botany* has been called for. The volume now under review deals with classification and physiology, and it is safe to say that no more reliable guide to the classification and physiology of the plant world could be found in the English language. Moreover, the book is issued by Messrs. Churchill in their well-known style of excellence, so that nothing is wanting to make it what, in our opinion, it really is—namely, a model treatise on systematic and physiologic botany.

THE CLARENDON PRESS.

Geometrical Exercises from Nixon's "Euclid Revised," with Solutions. By A. Larmor. Pp. viii + 170. This is a key which will be welcomed by those teachers who use Nixon's excellent text-book. The riders are reprinted, each being followed by either a hint or the full solution. The student is left to construct his own figures. The only requisite for such a book is that the solutions should be the work of a competent mathematician possessed of the requisite elegance of touch, and Mr. Larmor, who bears an honoured name, and who was himself a high wrangler at Cambridge, amply fulfils these requirements. Here and there comments and notes are appended, and in one place at least some original work which must greatly add to the value of the book.

The Junior Euclid, Books III. and IV. By S. W. Finn, M.A. In the course of last year we drew the attention of our readers to Books I. and II. of Mr. Finn's edition of Euclid. Most of the remarks which we then made will apply without modification to the present continuation of the work. "Every page reveals the experienced teacher. A method new, we believe, to English text-books, which we have long since adopted in our own teaching, and of the soundness of which we are fully convinced, is the uniform practice, in cases of the identical equality of two triangles, of marking by transverse bars, etc., the sides or angles upon which that equality depends. Such triangles are generally also drawn a second time in the text freed from all other lines in the figure, so as to show their identity more fully. The words 'problem,' 'theorem,' Q.E.F., and Q.E.D., and the division of the proposition into parts ('hypothesis,' 'construction,' etc.), are abandoned." We regret that Mr. Finn has given up the practice of the earlier volume and written ∠ABC thus, and not as he used to do, ABC. In our experience ∠ABC becomes frequently in a boy's hands LABC, and causes much trouble to the teacher who has to correct. "References" are given, but the pupil appears to be warned by the Preface not to insert them in writing, for a quotation is given from the Report of the Cambridge Local Examiners of 1899, who describe this as "useless knowledge." The teacher who does not agree with the Cambridge Local Examiners may find solace in the fact that the Oxford Local Examiners this year take the contrary view, so that possibly they may not be infallible at Cambridge, not even the youngest of them.

Mr. Finn's treatment is moderately conservative. So long as Cambridge and Oxford examiners bar the way to any real geometrical progress by their absurd regulation as to the retention of Euclid's order, a writer *must* be conservative or starve. He has altered iii. 35–7, however, and improved them. He has divided iii. 1, 3, 7, 8, 14, 15, 16, 31 into two parts, and has included in his text the converses of iii. 21, 22, 32, 35, 36. He gives the usual appendices concerning related circles, tangency problems, maxima and minima, inversion, pole and polar, radical axis, coaxal circles, etc., though some of these cannot be adequately treated without the Sixth Book. Lastly, the book is fairly well supplied with riders, and in the earlier book there were but few. The figures are exceedingly well drawn, bold and clear, with the necessary distinction between the data and lines added in the course of the proof.

GINN AND CO.

The Stars in Song and Legend. By Jermain G. Porter, Ph.D. Readers of THE PRACTICAL TEACHER are not unfamiliar with the stories of the stars, since we have on more than one occasion dealt briefly with the entrancing study. Those who wish to go further in this direction cannot possibly do better than become the possessors of this admirable little book, which we have read with much pleasure.

HACHETTE ET CIE.

La Belle Histoire du Prince Muguet. This is a bright and winsome little book for our young friends, and particularly for our wee French cousins. The story describes the thrilling adventures of the Prince Muguet, and also of the fairy-like fêtes and tournaments held on the occasion of his marriage with the beautiful Princess Florise. The illustrations are good, though perhaps lacking in those bright colours which, as a rule, please the tastes of the little ones of all countries. The same remarks apply to the binding, which might be made a little more attractive to the small folks.

JOHN LONG.

Barbara West. By Keighley Snowden. In his way of writing, Keighley Snowden is a disciple of Meredith; and though he falls short of his master in range of experience and in depth of thought, he yet rises above the writers of mediocre novels, and has a message of his own to deliver. His assumed name indicates a Yorkshire origin. Skipton is veiled under the name of Sheepton, and the author shows an intimacy with the sordid side of Yorkshire life which leads us to infer that he was born in one of the ugly modern towns of that county. The hero is the son of a shopkeeper in a small Yorkshire town, and in the opening chapters the author has very skilfully given what Henry James once called "a tinge as of dissent in a small English town, where there are brick chapels in back streets." Keighley Snowden has also been in a Yorkshire newspaper office, under a penurious proprietor; and he has worked shoulder to shoulder with the scandalously overwrought drudges by whom so many newspapers are produced. In short, the inside of a newspaper office has been drawn vividly and accurately. The closing chapters disarm criticism by their pathos. It is not a melodramatic pathos, but the pathos of real life. The tragedy is one that is repeated continually, and its repetition will still continue so long as parents leave their girls and boys to boggle through life unlearned in the knowledge that is essential to their wellbeing. Though not in the very first rank, *Barbara West* is still a notable book.

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Brick-Laying and Brick-Cutting. By H. W. Richards. This practical elementary treatise is arranged by the examiner to cover the City and Guilds of London Institute Technological Examination in Brickwork, and will be found to be a very useful book, not only for students for examinational purposes, but also to brick-layers and others interested in the subject.

The first part commences with clear, though brief, descriptions of the technical terms in general use. This is followed by bonding, hollow and sleeper walls, jointing, etc., and concludes with a short account of the subject of house drainage.

Gauged work in connection with arches and arch-cutting are dealt with in Part II.; and in Part III. a brief description of the materials used by the brick-layer is given. This section also treats of brick-making, brick-burning, the different varieties of bricks and their uses, the various kinds of cements, sand and the substitutes for it, concrete and mortar.

Finally, there is a chapter giving a clear account of the methods used in measuring brickwork, concrete, etc., useful memoranda, and a glossary of technical terms. As exercises, the papers of the City and Guilds Examinations in Brickwork for the last four years are given.

Those using the book are evidently assumed to be already familiar with the principles of projection; if not, the explana-

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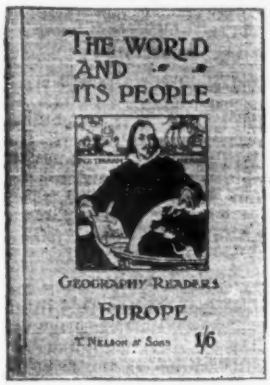

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